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More and Better Light

Boundless opportunities

PERHAPS because good lighting was for so long the most obvious boon that electricity brought to the majority, many supply authorities appear to regard this class of load as capable of looking after itself. In this they are in danger of falling into "the cardinal sin of taking for granted" its automatic growth. Growth there will be in these conditions, but only a small fraction of what it might be.

Leaving out of our reckoning the diminishing band of those who still cling to the view (possibly warranted in an earlier age) that the lighting load is a small and unremunerative one—as, indeed, it is likely to remain where this attitude towards it persists—how many undertakings, to take a crucial test, retain even one whole-time lighting officer, not to mention specialists in the several distinct branches of illuminating engineering? How much of the progress of recent years, although remarkable, has been the result of planned drives devised by them to secure the load?

Reasons for Progress

Such progress as has been made is due, we believe, to five other causes. They are: the discovery of new types of lamp, the product of the research laboratories; new applications of light; the trend towards the use of higher-wattage lamps; improvements in collateral branches of science (*e.g.*, glass, reflectors and fittings); and, finally, two-part tariffs, resulting in cheaper electricity for long-hour users, it is true, but providing at best only a passive method of encouraging development.

Each of these causes may reinforce one or more of the others. Take, for instance, the high-pressure discharge lamp with its enlarged potentialities due to the introduction of luminescent powders for adding red to the spectrum, and also the ultra-violet "black" lamp which excites these powders to give the brilliant effects that those present at the Torquay Convention of the I.M.E.A. will remember. Here it should be pointed out that colour correction is not always necessary or, indeed, desirable. The merit of the discharge lamp is not only that it emits many more lumens than did its predecessors for the same energy input; its peculiar spectrum is itself an asset in promoting acuity of vision where this is the main requirement, as in arterial road lighting and in workshops.

Floodlighting for utilitarian purposes is an obvious extension of the sphere for large economical lighting units, but when these are applied to decorative effects, collaboration with the architect is essential if the results achieved are to be acceptable. It is not enough for the electrical engineer to produce the goods; he must here, as elsewhere, seek the help of all those whose duty it is to advise the public on the matters in question in order that electricity may be used to the fullest extent because it is used to the best effect.

The present state of lighting technique and, just as important, its implications for the future are discussed in this issue by specialists from their various angles. Actual experience leaves little room for doubt that we are only just on the fringe of things. To come down to "bread-and-butter stuff," more than four million domestic premises are still without electric light. They will, when connected, make a substantial addition to the kWh sold for lighting, while the value of the wiring will run into a substantial figure.

But that is not the whole story. There is no doubt that the public is no longer content with the meagre allowance of foot-candles once deemed adequate for purely utility lighting, whether in the home or in the factory. An appreciation of the soundness of the physiological basis of the "Better Light, Better Sight, Better Health" campaign of E.D.A. and E.L.M.A. is being translated into demands for lamps of 75 W and more where 60-W or even 40-W units were formerly installed. For that reason the encouragement given to the use of the higher wattage lamps through the price reductions announced by E.L.M.A. is timely.

A Necessary Luxury

Such utility lighting is likely to create a stable demand, even during periods of financial stringency, and there is abundant evidence that its load and diversity factors both increase with better standards of illumination. What of the lighting that is more of the luxury type? "Give us the luxuries of life and we can dispense with the necessities," may be an amusing paradoxical saying; it may not be sound economics; but it is a matter of everyday experience that a "luxury," once it is deservedly established in popular favour, is nearly as difficult to dislodge from its position as a "necessity" would be.

Illuminating engineers can, however, claim as their own another paradox, and that is that the more the lighting load is developed the further does its saturation point seem to recede. Nevertheless, developments will be proportional to possibilities only if supply undertakings have on their staffs men with the requisite experience and ability to make them so.

Lamp Prices Down

THE reduction in lamp prices to which we have referred is a manifestation of a definite policy on the part of E.L.M.A., as previous reductions have been. For instance, in the past endeavours have been made to encourage the use of standard-voltage and pearl-glass lamps. This time the aim is to stimulate the sale of the higher-wattage lamps, thus supporting the object of the E.D.A.-E.L.M.A. Lighting Campaign. There is no change in the price of the 60-W lamp, probably the most commonly used, although a larger lamp is desirable or essential, but the sizes above this, commencing with the 75-W lamp, are to be substantially cheaper. We have the impression that at one time E.L.M.A.. wished to discourage the use of the 75-W size, for it was maintained at the same price as the 100-W. Its price has now been reduced below that of the larger lamp, probably as a means of inducing the purchaser to increase his wattage by easy stages.

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E.L.M.A. Trading Policy

THE Electric Lamp Manufacturers' Association is a strong supporter of the Fair Trading Policy and so to secure a more general adherence to that Policy it has rearranged its terms to various sections of the trade. Hitherto, lamps have been invoiced at varying discounts depending on the yearly purchases of the individual. In future each class of customer will have his lamps invoiced at a definite single rate of discount and quantity rebates will be paid periodically. This system should be easier to operate and enable all dealers to quote precisely similar terms to the same buyer and thus conform to the terms of the Fair Trading Policy.

The Manchester Trams

THE proposal that the whole of the Manchester trams shall be replaced, which is to come before the City Council at its next meeting, has called forth a number of protests from residents who desire the retention of tramways for various reasons. Letters which have appeared in the *Manchester Guardian* lay stress on the fact that to supplant trams by motor buses would be to change over from an assured home-produced "fuel" to an imported commodity, the supply of which would be imperilled in wartime. This, of course is a potent argument for the trolley-bus if it is decided that the trams must go. Other correspondents refer to the noise and odour of motor vehicles, while some deal with the matter on purely financial grounds and maintain that the trams have paid, and are paying, their way, while still affording cheaper travel than motor buses. Our contemporary hints that opposition to the proposal may be expected from the Electricity Committee, which stands to lose an important load, as well as from the Coal Utilisation Council.

Keeping Things Going

THERE is a bright side to the accident to the 30,000 kW turbo-alternator at Portsmouth. Damage from heavy flying fragments was singularly small, all things considered, and only one man was injured. There was, doubtless, an element of luck in this, but for the way in which the supply was maintained credit must be given to good organisation before, and personal qualities during the emergency. In the first place, all the consumers knew about the occurrence was that the voltage fluctuated, showing that the arrangements for using the grid functioned efficiently. In the second place, the two turbo-alternators next to the wrecked machine were re-synchronised and taking load within seven minutes. This promptitude on the part of the staff and employés, in spite of the fire then raging and the nerve-racking experience of a few moments before, provides a classic example of what can be accomplished by the coolness and courage that is traditional among power station men. If ever these qualities come to be tested by attacks from the air, the public can have confidence that normal conditions will be restored as soon as may be humanly possible.

Interference with Television

As a result of a number of talks at Radiolympia with television manufacturers and dealers who have already sold television receivers, we find that it seems to be fairly generally agreed that one of the major problems which will have to be faced in the near future is that of electrical interference. On vision, interference mainly takes the form of "snowstorms" on the screen, bad cases looking like a blizzard, in which the snow is travelling horizontally at a high speed. On the sound channel, loud crackling noises are produced, which are even more distressing to the ear than the vision interference is to the eye. Although the interference is unquestionably due to electrical causes, the electrical industry for once can be acquitted of any serious complicity in the matter. The main source of trouble is the ignition systems of motor vehicles, and where receivers are installed close to traffic laden roads, or on the fringe of the television service area, it can be very serious. No doubt some improvement will in time be effected by special television receiving aerial systems, but, as in other cases of interference, the best method of tackling the trouble is to deal with it at the source. In the case under consideration, it would appear that nothing short of a Government measure making car interference suppression compulsory will ever be successful.

Eye-Flash

WHILE few serious accidents accompany the rapidly expanding use of electric welding, cases of conjunctivitis are on the increase. The chief sufferers are not the men actually engaged on welding, since their eyes are protected by suitable goggles (*e.g.* Crookes glass, as recommended in B.S.S. 679) which absorb little visible light but which cut off injurious ultra-violet radiations. Men working perhaps an appreciable distance away, such as crane drivers, are the most likely to catch a flash, the painful effects of which may not be felt for five or six hours afterwards. An investigation has recently been made by the United States Bureau of Standards (Circular C421) into the question of whether there is a distance at which arc welding produces no ill consequences to the eyes. The chief protection (if any) is reduction in intensity which varies inversely with the square of the distance, but as so many factors, including length of time of exposure, individual susceptibility and kind and size of arc, have to be taken into account, in addition to atmospheric absorption (which is relatively low for the wavelengths concerned), the conclusion was reached that no minimum safe distance could be specified. It is clear, then, that either the arc should be shielded or the eyes of the worker protected where arc welding is exposed to his view.

The Lighting Load

Its value to the supply undertaking

By R. H. Rawll, M.I.Mech.E., M.I.E.E.

The author does not think there is a very widespread appreciation of the potentialities of the lighting load and he suggests that more vigorous efforts would open up an immense field

IT is well known, of course, that lighting formed the original load of the electricity supply industry; indeed, it represented the sole reason for the initiation of that industry. Equally obvious is the fact that the financial value of the lighting load to supply undertakings to-day cannot be questioned, as a perusal of the revenue accounts will clearly demonstrate.

There is, however, an impression existing among the staffs of many supply undertakings that, in general, the load characteristics of lighting are still the same as they were in the days of the infancy of the supply industry and that, therefore, comparatively high prices for lighting are always justified. Furthermore, as a consequence of this state of affairs, it is the general opinion that the market is already saturated with regard to the lighting load of existing consumers, and that does not warrant the same attention as is being paid to the advancement of load building in connection with other later applications of electricity, such as cooking and water-heating.

Mr. R. H. Rawll is sales and development engineer to the Birmingham Electric Supply Department

Although certain types of lighting installations may still present the same load characteristics as those of thirty or forty years ago, careful consideration of undertakings' load curves and the analysis of the different classes of lighting installations will conclusively show that it is a decidedly mistaken idea to imagine that *all* lighting load is necessarily present at a time corresponding to the peak load of the undertaking. Already in some undertakings with a large proportion of domestic business the peak load has shifted from the evening to Sunday morning, due to the incidence of the cooking and other domestic load. It will also be seen that the load factor of certain types of lighting installations is decidedly good and that in many cases it is higher than that of power loads which are usually supplied at fairly low prices.

Four Different Classes

Lighting installations can roughly be divided into four different categories, *viz.*, domestic, commercial, industrial and street lighting. Each of these classes has its own broad characteristics as regards actual loading conditions, although a further sub-division of each group will show considerable differences in this respect. For example, it is not always realised that public houses have an individual load factor, as far as lighting is concerned, of 10 per cent. to 15 per cent., all of which is off-peak.

It hardly comes within the scope of this article to refer in detail to the trend of development of the various classes of lighting installations and the reasons for that trend, but it may be of interest to mention that statistics show that in two residential districts in London the annual consumption for lighting per house has more than doubled during the last twelve years.

Reference to the sales of electric lamps also shows that householders are steadily adopting 75-watt and 100-watt lamps instead of 40-watt and 60-watt lamps. In general it may be said that the upward trend of the level of illumination has also been accompanied by a more extended use throughout each day, thus improving the load factor to a considerable extent.

Although the introduction of two-part tariffs in many cases has been a direct incentive to encourage increased consumption for lighting purposes, particularly amongst domestic consumers and large business and commercial concerns, there is still an immense field for obtaining increased consumption from such consumers as small shopkeepers, by means of a simple flat-rate tariff, if this can only be offered at a more attractive figure than is general to-day.

Special Tariffs

It is true that most supply undertakings offer cheap rates for advertising lighting and shop window "after hours" lighting, but usually the ordinary rate for lighting is from two to three times higher than such special rates. Progressive supply undertakings are fully alive to this matter, and while it is essential that ordinary lighting should bear only its proper share of the peak load costs, it must not be forgotten what a large proportion of revenue is derived from this source and consequently what a very marked effect the reduction of lighting tariffs has on the supply undertakings' income.

As regards the future development and fostering of the lighting load by supply undertakings, the present position

Shop-window lighting by means of two 250-W mercury discharge lamps in angle-type reflectors

appears to be that, as it is recognised that every consumer must perforce have lighting, there is no need to take active steps to encourage its more extensive use. A certain amount of interest has been awakened in this matter by the recent "Better Light—Better Sight" campaigns, but a real appreciation of the potentialities of the possible lighting consumptions which could be obtained does not seem to be very widespread. The lighting load has never been pushed as vigorously as, for example, the cooking and water-heating loads, and consequently its progress is small compared with the results which have been achieved in connection with these other two types of load.

Public lighting in Priory Road, Edgbaston, by 250-W mercury discharge lamps mounted at 25 ft.

Lighting Advisers

The position in this respect is very different in other countries, however. In the U.S.A., for example, there is usually incorporated in every supply undertaking a complete lighting sales department, whose sole object is to increase the sale of electricity for lighting, and as regards domestic lighting alone there are 1,800 home lighting advisers to call at homes for demonstration purposes and to give suggestions for lighting improvements. Already two million homes have been called on for this purpose.

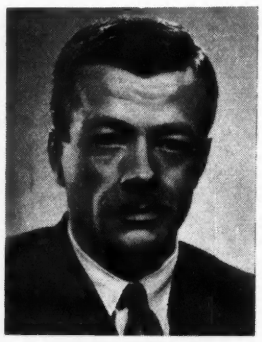
It therefore seems essential that every supply

Legislation and Factory Lighting. By W. Robinson, B.Sc.

A survey of the past twenty-two years and of the present position

Factory managements are urged not to hold up lighting improvements pending forthcoming legislation, which will, after all, deal with minimum requirements only. Better illumination means an all-round improvement in factory efficiency and conditions.

FOLLOWING the stimulating report of the Ministry of Transport Departmental Committee on the lighting of traffic routes, the forthcoming report of the Departmental Committee on Factory Lighting is awaited with lively anticipation. The Government and, particularly, the Inspectorate of Factories and Workshops, has, for over twenty years, shown a genuine interest in the lighting problem as it affects industry, and the lighting section of the Chief Inspector's annual report is, and has long been, an illuminating commentary on a somewhat unsatisfactory theme. Lest it should be thought that lighting legislation is being sprung upon industry, it should be remembered that three Departmental Committees have considered this problem prior to the present committee, the first as far back as 1915, the second in 1921 and the third in 1922.



[J.S. Murray

Mr. W. Robinson, B.Sc., of the Engineering Department of the E.L.M.A. Lighting Service Bureau

The first Committee's report occupied three good-sized volumes and contained a veritable mass of experimental results. As the means of lighting at that time were carbon lamps, arc lamps, gas jets, or just "lamps various," it can be imagined with what difficulty the Committee compiled its recommendations, but compile them it did. We of the present day are not, I hope, ungrateful for this, the first real step in the handling of a very thorny problem.

Here, briefly, are the recommendations of the First Report, 1915:—

1. There should be a statutory provision—
   (a) requiring adequate and suitable lighting in general terms in every part of a factory or workshop, and
   (b) giving power to the Secretary of State to make orders defining adequate and suitable illumination for factories and workshops or for any parts thereof, or for any processes carried on therein.
2. Minimum illumination at floor level over "working areas" of 0.25 foot-candle.
3. Minimum illumination in all "working areas" of iron foundries at floor level of 0.4 foot-candle.
4. Minimum illumination in all parts of factories over which persons are liable to pass (not included under paragraph 2) of 0.1 foot-candle.
5. Minimum illumination for factory yards and open spaces where persons are employed between one hour after sunset and one hour before sunrise of 0.05 foot-candle (the official summary gives this figure as 0.25, which is clearly a misprint).
6. Power of exemption in individual cases.

In pursuance of section 1 (b) of the First Report further work by the Committee resulted in 1921 in the following recommendations:—

(a) Any light source within 100 ft. from any person shall

The Lighting Load (*Continued from preceding page*)

undertaking in this country should have on its staff at least one man whose sole job would be to develop the lighting load.

Electricity supply undertakings are now fully alive to the real meaning of the word "service," but they will never derive the maximum benefit from it until it is applied to all classes of load, *i.e.*, not only for other loads like cooking, water-heating and power, but also for lighting.

It is sometimes not realised that for a given consumer there is a definite practical limit to his consumption for cooking and heating, whereas in connection with lighting the main limit is the economic one.

It must also be remembered that in many cases where lighting improvements are to be made the expenditure is limited to the provision of the fitting and lamp, the existing wiring being utilised, whereas the installation of other applications of electricity usually involves additional costs with respect to wiring alterations or extensions.

Above: An example of efficient industrial lighting at the works of the Birmingham Aluminium Casting Co., Ltd. Left: Modern lighting at Lewis's stores, Birmingham

The developments in lamps and lighting equipment have been very considerable during the last few years, much of which is unknown to the average individual. It is surely, therefore, the duty of every supply undertaking at least to take such steps as will bring these advantages and benefits to the notice of its consumers.

be cut off at an angle not less than 20 deg. or, in the case of a person employed within 6 ft. of the source, not less than 30 deg.

(b) Adequate means shall be taken to prevent direct reflection of light from a smooth or polished surface into the eyes of the worker.

(c) Adequate means shall be taken to prevent the formation of shadows which interfere with the safety or efficiency of the worker.

(d) No light sources which flicker or undergo abrupt changes of candle power in such a manner as to interfere with safety or efficiency shall be used.

(e) A reasonable time limit to be given in the case of existing installations before these requirements become operative.

The problem of "adequacy" was next deal with. Industrial tasks were classified in two divisions "fine" work and "very fine" work, it being felt inadvisable at that stage to complicate the issue by the third classification —"medium." Discussions with industrialists, in particular representatives of operatives and employers in the silk, cotton and wool industries, took place around the suggestions for numerical standards of illumination for processes within these two classifications and the conclusion was arrived at that the enforcement of legal minima was not practicable at this stage.

Good and bad lighting at the same laundry premises. The main objections to the original illumination scheme (above) are: Insufficient reflector cut-off, causing glare; mounting height too low in several cases; intensity, particularly at floor level, too low; and unevenness of illumination, producing hard shadows and visual discomfort

One important factor that influenced this decision is worthy of note, namely, that since the voluntary standard of factory lighting was improving, the imposition of necessarily low mandatory minimum values, giving the impression that such values represented adequate and sufficient lighting in the full sense of the term, might conceivably give an excuse for depressing existing practice. Accordingly in 1922 the following recommendations were submitted:—

(a) That definite legal minima be not imposed, but that a specification of numerical recommended standards of illumination be issued for different groups of processes.

(b) The standard of illumination for processes classed as "fine" work (Schedule A in Appendix I following the report) shall not fall below 3 foot-candles, and for processes classed as "very fine" work (Schedule B) shall not fall below 5 foot-candles, these figures being subject to amendment from time to time.

The Present Position

The Factories Act, 1937, is now in force and contains the general provisions, *i.e.*, 1 (a) and 1 (b) of the First Report. It now remains for the Committee at present dealing with the matter to implement these general provisions with mandatory numerical standards in the light of the findings of the previous committees and with due consideration to the vast changes in lighting technique and standards, and to the recent almost phenomenal reduction in lighting costs.

It is not my intention to attempt in any way to forecast the findings of the Departmental Committee, or to express any opinions. The complexity of the subject is greater than is commonly realised, the desirability of the legislation unquestionable. Perhaps the greatest difficulty that remains is that of interpretation (a) by the Factory Inspector, and (b) by the light user.

Correct Interpretation

The gravest doubt arises in the interpretation of the new lighting requirements by the factory managements themselves. It has already been expressed as an objection to lighting legislation that a wrong interpretation of mandatory values might serve to discourage, rather than encourage, the present tendency to higher standards of illumination. This lesser objection has given way to the greater need, but the foundation for it may still exist and it would be a great pity if a reform so useful as this were to be stultified, or if the equally important *voluntary* movement for lighting reform were to be impeded, by a purely literal reading of the Act.

Let it be remembered that the Government is concerned with the minimum requirements of lighting for health, safety and welfare of the working population—the minimum requirements only. The Government Research Departments acknowledge and advocate the use of high levels of illumination as a means of improving factory efficiency all round, and are wholehearted in endorsing the extended application of better factory lighting. Their terms of reference, however, preclude any considerations apart from the above-mentioned minima, and it is upon private or commercial enterprise that, as ever, we must look for the true lighting reforms.

It is strongly urged that lighting improvements be proceeded with according to schedule and not held up pending legislation. With all the assurance in the world I, among others, whose work is with industrial lighting, can say that no factory or workshop lighted to modern standards and with a reasonable maintenance system in operation need ever fear the introduction of the new lighting provisions.

It is upon the members of the electrical trade, however, that the responsibility rests for ensuring that the new lighting regulations are correctly interpreted. Now, more than ever before, is the time to press forward the cause of better lighting in factories. A hundred thousand factories and workshops in Great Britain have already received the first of five mailing pieces being sent out this autumn by the Better Light Committee of the Electrical Development Association and the Electric Lamp Manufacturers' Association, as part of a National Lighting Campaign jointly promoted by these Associations.

The executives of these factories, etc., will be five time reminded that their lighting is liable to official inspection. Each will receive five separate offers of a free light meter survey and, throughout the campaign, expert advice on all factory lighting problems is to be freely given by E.D.A.-E.L.M.A. lighting experts. Extensive advertising in the National and Trade Press is to support the campaign, backed up by demonstration lectures up and down the country. We hope that all members of the electrical trade will co-operate by:—

(a) Adding their weight to the drive for *immediate* lighting improvements and urging a correct perspective of factory lighting legislation.

(b) Possessing light meters and supporting the principle of "measured light."

(c) Following up inquiries, large or small, with equal promptitude.

A lifetime includes only a few great opportunities. This is one: let us not waste it.

Floodlighting. By Arthur Mansell

Methods of securing the most effective results from installations

In addition to revealing the beauties of buildings at night, floodlighting is finding an ever-growing number of commercial and industrial applications

SINCE its earliest introduction floodlighting has enjoyed a universally popular appeal for revealing the beauty of buildings and monuments at night in an attractive and dignified manner. Apart from this æsthetic standpoint, it has very wide commercial and industrial applications. It is being adopted more extensively than ever for the lighting of sports grounds, parks, gardens and fountains, while a large number of swimming baths are now floodlighted either by overhead projectors or by underwater units or by a combination of both systems.

Mr. Arthur Mansell is with the Edison Swan Electric Co., Ltd.

Advertising specialists have been quick to appreciate the value of rendering posters and signs attractive by night and floodlighting is recognised as one of the best methods of compelling attraction after dark. Railway companies have found floodlighting invaluable for the safe illumination of shunting yards and sidings, and the demand for adequate lighting of car parks and garages has also been met by similar means, while for airports it is indispensable.

Although the term "floodlighting" is not so commonly applied to interior lighting systems, many types of installations should strictly come under this heading. In addition to providing an adequate and glareless form of illumination, floodlighting of the interiors of cathedrals and churches permits an uninterrupted vista of the architectural features and produces a mellow radiance comparable with daylight.

In ballrooms, public halls and picture galleries, too, floodlights are often utilised for direct or indirect schemes of illumination. The Empress Ballroom at Blackpool, for instance, with one of the largest dance floors in Europe, depends for its colour illuminations on a system of about a hundred and fifty 500-W floodlights mounted approximately 40 ft. high.

Obtaining Contrast

So far as the illumination of buildings and monuments is concerned, the attractiveness of floodlighting is largely dependent on the measure of contrast obtained with the surroundings. Since small differences of brightness are not perceptible to the observer, it is obvious that except where there is marked colour discrimination the subject floodlighted must be of outstanding brightness. For example, the floodlighting of a white stone building can be rendered almost valueless if the buildings adjacent are receiving a large quantity of light from nearby street lanterns. In such instances and especially if the building is high and has a terraced or stepped frontage, greater prominence can be obtained by illuminating the higher portion only.

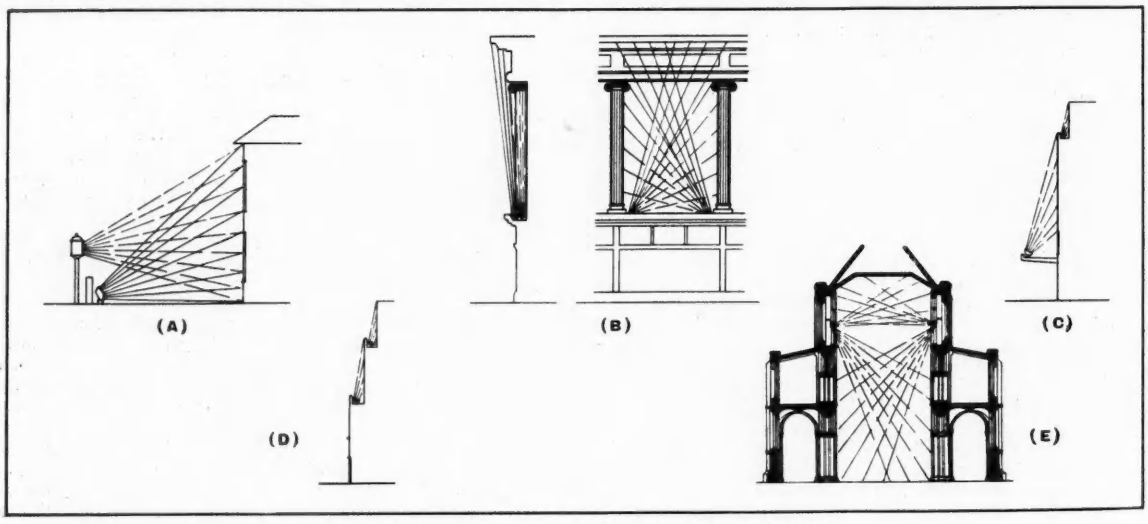
With the tremendous variety of styles of architecture it is difficult to lay down any hard and fast rules for floodlighting. Some buildings require absolutely even illumination of the complete elevation, while others demand the emphasis of certain features. In order to avoid "flattening out" it is desirable to reproduce as nearly as possible the shadows which are normal under daylight conditions: the latter remarks apply especially to buildings in which columns or projecting piers are a feature. Unnatural shadows must, however, be avoided, otherwise the structure will be given a distorted and often grotesque appearance.

TABLE No. 1.—ILLUMINATION RECOMMENDED.

Nature and colour of surface.	Condition of surface.	Reflection factor.	Foot-candles recommended surrounding brightness.		
			Low.	Medium.	High.
White brick ...	Clean	85%	1.5	2.5	4.0
	Fairly clean	60%	2.0	3.5	6.0
	Fairly dirty	30%	4.5	7.5	12.0
Portland stone ...	Clean	60%	2.0	3.5	6.0
	Fairly clean	40%	3.5	5.5	9.0
	Fairly dirty	20%	6.5	11.0	18.0
Middle stone ...	Clean	40%	3.5	5.5	9.0
	Fairly clean	26%	5.5	9.0	14.5
	Fairly dirty	13%	10.5	17.5	28.0
Dark stone ...	Clean	30%	4.5	7.5	12.0
	Fairly clean	20%	6.5	11.0	18.0
	Fairly dirty	10%	13.0	22.5	36.0
Yellow brick ...	Clean	35%	4.0	6.5	10.5
	Fairly clean	24%	5.5	9.0	14.5
	Fairly dirty	12%	10.5	17.5	28.5
Red brick... ...	Clean	25%	5.5	9.0	14.5
	Fairly clean	16%	8.5	14.0	22.5
	Fairly dirty	8%	17.0	28.0	45.0
Buff paint ...	Clean	50%	2.5	4.5	7.0
	Fairly clean	32%	4.2	7.5	11.5
	Fairly dirty	16%	8.5	14.0	22.5

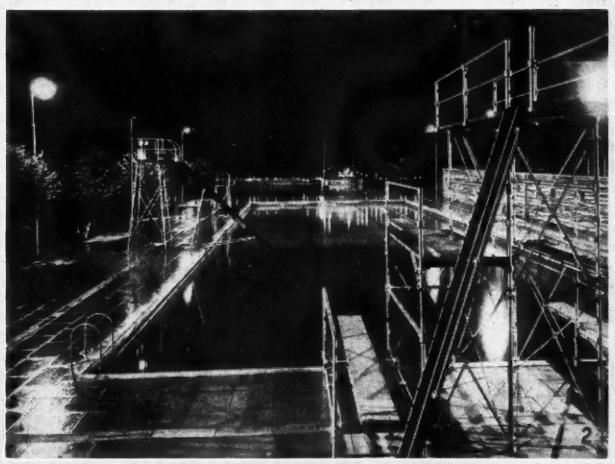
Obviously floodlighting is most attractive when the illuminants are concealed from direct view, and thus we find it the common practice of architects when designing new buildings to provide for the proper concealment of projectors as an integral feature of the façade. When buildings have no forecourt for the location of floodlights and it is not desirable or possible to bracket units on to the building, an alternative is to mount suitable equipment housed in decorative lanterns on posts, or sometimes permission can be obtained to fix the projectors on the roofs of buildings opposite.

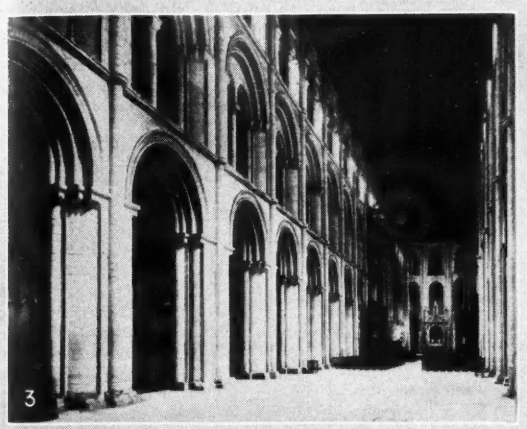
A few examples of the most common situations for fixing floodlights are illustrated by the accompanying diagrams. While it is not possible to allot sufficient space for dealing fully

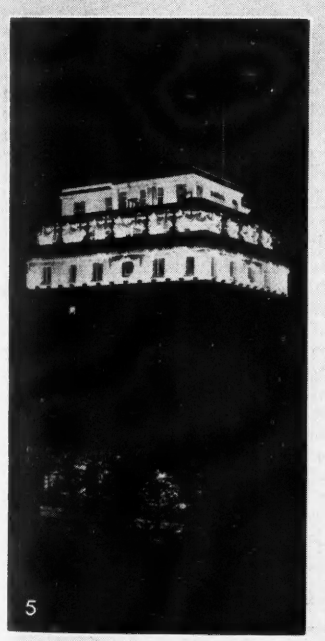


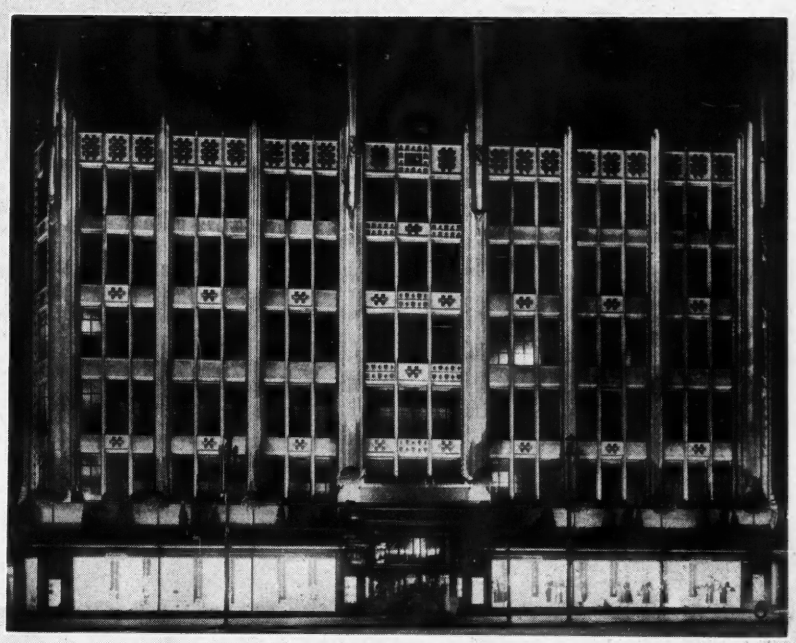
A few of the most common situations for fixing floodlights

A. Buildings of medium height: wide-angle floodlights with asymmetrical reflectors, located in forecourt or in decorative lanterns. B. Columned elevation: narrow beam units with parabolic reflectors and spreading glass fronts. C. High buildings: lower façade lighted from narrow beam asymmetrical floodlights mounted on canopy or decorative brackets. D. Stepped frontage: asymmetrical trough pattern units screened by balustrades. E. Cathedrals (nave): special projectors with parabolic reflector and auxiliary mirror for directing spilled light to roof. Projectors are fixed at clerestory level.









Some of the Situations in Which Floodlighting is Employed to Advantage

1. A railway marshalling yard. 2. An open-air swimming pool, using wide-angle floods on 20-ft. poles. 3. The nave of Peterborough Cathedral, where special projectors are located at clerestory level. 4. Flower beds, with the floodlights concealed in trees. 5. The upper elevations only of a building, to produce a marked contrast. 6. The complete elevation of a large store, utilising G.E.C. floodlights with electric discharge lamps on the canopy.

with the various methods of planning and calculations necessary for the design of the many different forms of floodlighting installations, Table 1 will serve as a useful guide to the foot-candle intensities recommended for various surfaces. It should, however, be noted that these intensities are average for general-purpose floodlighting designed on an economic basis and should not be considered adequate for exhibition and festival purposes, where, in order to produce highly spectacular effects, very much greater intensities are necessary.

The design and correct selection of equipment is of paramount importance, and to-day the engineer is fortunate in having at his disposal a very wide range of units, accessories, and lamps suitable for every conceivable type of installation. Also for industrial work there has been developed a range of heavy-duty apparatus specially designed to withstand rough usage.

Floodlight projectors are designed for a given purpose, and the beam spread, or the angle of diversity of the beam, is dependent upon the optical characteristics of the reflector, front glass, and type of lamp employed. Although projectors are manufactured to many different sizes and shapes for various lamp ratings, they can roughly be divided into the seven groups detailed in Table 2.

Colour Floodlighting

The use of colour floodlighting for permanent installations has shown a marked increase within the last two years. This can be attributed mainly to the introduction by E.L.M.A. of electric discharge lamps, which, by emitting coloured light, render highly absorbent colour screens unnecessary. Apart from this, the lumen output per watt of electric discharge lamps is so much higher than that of tungsten lamps that, whereas with the latter it is necessary to increase considerably the wattage for colour floodlighting, with the former a higher foot-candle intensity is obtainable for a lower current consumption. At present the colours obtainable with electric discharge lamps is somewhat limited, but it is safe to predict that with the constant research in lamp design and the development of light sources with fluorescent coated bulbs, a very much larger range of colours will ultimately be available.

TABLE No. 2.

Type of floodlight projector.	Lamp size and type.	Normal beam spread (approx.).
No. 1. Narrow beam units with deep parabolic reflectors for projector type lamps.	1,000-W. projector 500-W. ,, 250-W. ,,	12° to 25°
No. 2. Medium beam units with deep parabolic reflectors for standard lamps.	1,000-W. standard 500-W. ,,	25° to 40°
No. 3. Wide beam units with projector type lamps, and diffusing fronts, or standard lamps and sectional reflectors.	1,000-W. projector or standard 500-W. ,,	40° to 60°
No. 4. Elliptical beam units with deep reflectors, projector type lamps and spreading glass fronts.	1,000-W. projector 500-W. ,, 250-W. ,,	15° to 30° in one axis. 45° to 90° in other axis.
No. 5. Narrow beam asymmetrical rectangular pattern units for line filament projector lamps, or electric discharge lamps.	1,000-W. line projector 500-W. ,, 400-W. discharge 250-W. ,,	20° in vertical axis by 80° in horizontal axis.
No. 6. Wide beam asymmetrical rectangular pattern units with standard lamps or electric discharge lamps.	1,500-W. standard 1,000-W. ,, 500-W. ,, 400-W. discharge 250-W. ,,	60° to 90° in vertical axis by 100° in horizontal axis.
No. 7. Wide beam asymmetrical trough pattern units for long (46in.) electric discharge lamps.	400-W. discharge, red 250-W. ,, blue 250-W. ,, green	40° to 50° vertical axis by 120° in horizontal axis.

Electric discharge lamps are not suitable for all classes of light projection, but Table 3 details the approximate comparative wattages required for a colour floodlighting scheme utilising wide-angle asymmetrical units, and illustrates the economy which is effected by the use of various types of electric discharge lamps.

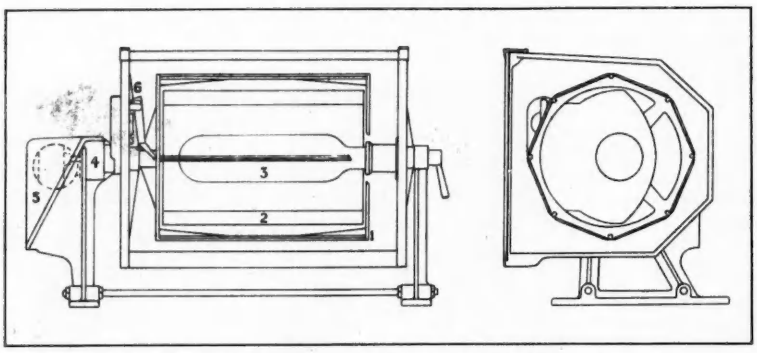
Animated floodlighting compels attraction, and highly spectacular effects are obtainable by controlling the circuits of various batteries of projectors fitted with tungsten lamps and colour screens by means of motor-driven dimmers or flashers. Owing to the high initial expense of the apparatus, multiplicity of projectors required, and operating costs, such schemes have hitherto been used chiefly in conjunction with special temporary displays or for exhibition purposes.

TABLE No. 3.

Lamp.	Colour.	Wattage factor.	
		Discharge lamp.	Tungsten with colour screen.
Electric discharge ...	Bluish white...	0.35	1.9
,, ,, ...	Light green ...	1.2	3.5
,, ,, ...	Dark green ...	1.6	4.0
,, ,, ...	Light blue ...	1.2	3.5
,, ,, ...	Dark blue ...	3.4	10.0
,, ,, ...	Red	1.6	3.4
Neon	Yellow ...	0.3	2.3
Sodium			

The above comparisons are based on the assumption that the wattage factor for white floodlighting employing tungsten lamps is unity.

Recently, however, there has been developed an automatic colour-changing projector which permits a cycle of colour changes to be obtained from one unit. In this particular apparatus the light source employed is a line filament projector lamp, and between the lamp and reflector an octagonal frame fitted with different colour screens is rotated by means of a synchronous electric motor through a reduction gear. Between a rotatable colour frame and the driving gear a clutch mechanism is introduced which can be operated by a remote control so as to permit the colour frame to be stopped at a given colour or position.



The constructional arrangement of the "Ediswan" automatic colour-changing projector

1. Rotatable colour frame. 2. Reflector. 3. Line filament projector-type lamp. 4. Clutch mechanism. 5. Synchronous motor and fuses. 6. Solenoid (setting action). 7. Adjustable mounting 0°-90° training.

It will be appreciated that with this new equipment, whereas for an elevation requiring even illumination and normally necessitating four projectors for a white lighting effect, a colour-changing display can be produced without increasing the number of units, thus making the installations very economical in maintenance and initial cost.

Another interesting feature of the automatic colour changing projector is that the clutch mechanism of a number of these units can be electrically coupled to a flasher or time switch so that all the rotating colour screens can be automatically brought into step, producing a monochromatic effect of any given colour. This apparatus is to be marketed by the Edison Swan Electric Co., Ltd.

Industrial Applications

Floodlighting for industrial uses is, in the majority of cases, required to enable work to be continued after dark with as nearly as possible the same safety and efficiency that daylight conditions permit. Therefore (and also for such applications as shunting sections, wharves, goods depôts, foundry yards, etc.) it is essential to avoid heavy shadows being thrown across the working site. Glare must be reduced to a minimum, and specially robust floodlight projectors should be placed so as to be immune from accidental damage.

The illumination values required for industrial uses naturally depend on the type of work, speed of operation, and risks contingent thereto. The foot-candle intensities in Table 4 cover just a few of the applications in industry.

TABLE No. 4.

Railway sidings, yards, wharves, docks, etc. ...	0.15 to 2 foot-candles.
Quarrying ...	2 to 5 ,,
Building construction ...	4 to 7 ,,
Road repairs	1 to 3 ,,
Car parks	0.5 to 1 ,,

It is obviously impossible to condense in an article such as this all of the important factors pertaining to various classes of light projection schemes, and it must be appreciated that I have been able to deal only with very general outlines of the subject. Information regarding the requirements for any specific uses will be readily given by the E.L.M.A. Lighting Service Bureau or any well-known lighting specialist.

Lighting as Decoration

By Edgar H. Penwarden

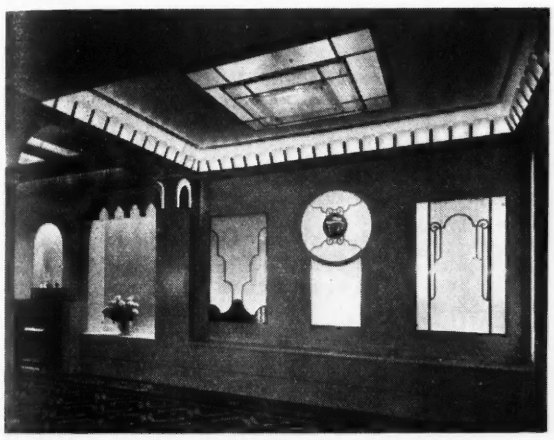
An increasing new use for electricity

The co-operative efforts of the illuminating engineer and the artist in producing pleasing decorative lighting effects are already finding a growing application. The householder can also obtain such effects for quite a modest outlay

IN Lloyd's Encyclopædic Dictionary the first definition of the word "decoration" is given as the act of decorating, embellishing or adorning, and as an example the following extract from Macaulay's "History of England" is quoted: "If he attempted decoration, seldom produced anything but deformity." Although electric lighting as a means of decoration was unknown when this sentence was written, it is a warning to those seeking to produce decorative lighting effects.

The facilities available for this purpose are extensive and varied, but to ensure satisfactory results a combination of scientific lighting technique and artistic perception are absolutely essential. Light is the means by which decoration is revealed, but it can also be used as a means of decoration, that is to say, purely for effect and not for utility. Electric lighting is now extensively employed in this manner, and if suitable to its environment can be decorative in the true sense of the word.

There is scarcely any limit to the variety of ways in which it can be utilised. One of the earliest was repeating varied coloured lamps in line and festoon form, and a visit to the seaside towns will reveal its continued popularity as a means of creating a festive atmosphere. The Coronation decorations last year gave ample scope in this direction, but the discriminate use of floodlighting apparatus emphasised the



Various forms of interior decorative treatment giving mainly silhouette effects against an illuminated background

fact that broader and more dignified effects are obtainable by adopting modern appliances and technique. The primary difference between the two systems is that in the former the light source is visible and in the latter it is concealed. In the one the light source is in itself the effect, but in the other it creates the effect on selected forms or surfaces.

With certain modifications, decorative lighting effects can be classified under the two headings "direct" and "concealed," but it is desirable to understand that the term "concealed" is used in a relative sense, for sometimes the light source can only be concealed from the observer when looking towards the object illuminated or when the unit and illuminated surfaces are above the sight line.

The floodlighting of buildings, trees, shrubs and flower beds, fountains and cascades, under-water, frieze and cornice, curtain and niche lighting, and refracted light through the edge of plate glass are a few of the subjects and methods which lend themselves to the production of decorative lighting effects, but who shall put a limit to the ingenuity and originality resulting from the co-operative efforts of the illuminating engineer and the artist?

The floodlighting of buildings has been the subject of much adverse criticism from architects, but as much of this criticism was constructive the lighting specialist has profited by it. The primary fault of some illuminating engineers is an obsession that good lighting is the even illumination of all the surfaces. This principle may be desirable for indirect lighting, but when applied to an architectural structure it makes it appear a formless mass.

The floodlighting of buildings should be directional and preserve the form of the main features, the expression of form depending on light and shade. Heavy shadows can sometimes be softened by the introduction of auxiliary lights correctly located for the purpose. In some cases architectural features can be emphasised by localised lighting of higher intensity than the main façade. Charming silhouette effects can be obtained by placing the units behind isolated features such as columns in a loggia.

Mr. E. H. Penwarden is chief designer of the General Electric Co.'s Decorative Lighting Department

The introduction of colour must be restrained to avoid garishness, but it can be very effectively utilised to accentuate coloured surfaces. For instance, the façade of a building built with a combination of light stone and red brick will respond to a combination of red and white light. The proportion of each colour and the location of the floodlighting units should be carefully determined to suit the circumstances. Trees, shrubs and garden beds give ample scope for treatment and the most charming effects are obtainable by the use of floodlights in conjunction with small watertight trough lighting units.

Attractive designs of illuminated pylons and standards with mushroom-shaped tops, giving downward indirect lighting or fashioned in conventional flower forms, are effective if discriminately placed, and with fountains and cascades illuminated with dimmer-controlled colour-changing apparatus the time for the enjoyment of the beauties of nature is extended to the hours of darkness. The popularity of this application of decorative lighting has established itself to such an extent that the lighting apparatus in its various forms has been standardised and is obtainable from many manufacturers of electrical equipment.

The application of artificial lighting for interior decoration has captured the interest of all classes of the community. The proprietors of modern hotels, restaurants and places of amusements were quick to recognise its attractions, and their foresight and enterprise has provided the opportunity for the architect and decorative artist to develop a new technique.

To a certain extent the actual design of many modern interiors is based on a preconceived lighting scheme, the decorative effect being dependent largely on artificial illumination. Ceilings are specially formed to accommodate lighting equipment, while the panelling round the walls is set forward to provide space for concealing light sources, to illuminate the

Combined fluorescent and tungsten-lamp lighting in the ballroom of the Grosvenor Hotel, Edinburgh

frieze below and/or to facilitate the introduction of illuminated wall features. In fact, in many cases the design of the interior decoration and the selection of surface fabrics is determined solely for the purpose of creating decorative lighting effects.

The public, when on pleasure bent, is attracted by congenial surroundings, and is quick to appreciate the possibilities of introducing them into the domestic circle. This fact is evident

Hampton Court Palace provides an excellent example of colour floodlighting to accentuate the red brickwork

by the demand for decorative lighting in the home. The wiring of a modern house is no longer simply a matter of providing for the necessary illumination. The women-folk have discriminating tastes and require facilities for decorative lighting effects. The simplest and most practical method of providing for this is the introduction of adequate plug-points in the skirting. Floor standards, table standards, illuminated vases and flower stands at eye level are features in a modern room.

Most people like periodical changes in the arrangement of their rooms, and an entirely new atmosphere can be created by altering the positions of furniture and of existing decorative features. With plenty of plug-points this becomes possible without provoking the very reasonable objections raised against long, unsightly and dangerous trailing flexible leads.

The illumination of curtains from a light source, sometimes concealed behind a pelmet, is now widely recognised as an excellent subject for decorative lighting. The fabric of the curtains should be carefully chosen in relation to its reaction to artificial light. For instance, very striking and charming effects can be obtained from a plain velour by brushing the pile in different directions, or from materials such as artificial silk which have been put through a process of crushing.

Niches illuminated by concealed lights and backed with sandblast engraved white or tinted mirror glass provide charming local decorative effects in a room. Figures or foliage which look very tasteful in daylight take on an equally pleasing aspect at night as silhouettes against a plain illuminated back-

Charming effects can be obtained in private gardens for a modest outlay

ground. The application of the principle of projecting light through the edge of plate glass has been effectively utilised for advertising purposes in the form of the "Internalite" sign, but it is open to more extensive use in the decorative field. It may not be generally known that brilliant effects of this nature can be obtained by *reflecting* a portion of the light only through the edge of the glass, thereby enabling the rest of the light to be used for utility purposes.

The decorative treatment of plate glass by sandblast and acid processes has developed into a fine art which can be most effectively revealed by light refraction. It is important, however, to provide a continuous and brilliant light along the edge of the glass and avoid a brightly lighted background behind the decorated surface, as the brilliance of the effect depends upon contrast to its immediate surroundings. Clear glass rods which are obtainable in various colours and sizes are utilised for decorative effects, and if illuminated with clear architectural tube lamps they reflect the images of the filament so brilliantly that the rods appear to contain the filaments. Such brilliant effects tend to be garish if misapplied and they are most suitable when viewed from a distance.

Scientific equipment and the fabrics used for interior decoration have played a big part in the progressive trend in decorative lighting, but we must turn to the actual light sources for the developments of the future. Filament lamps are being superseded by luminous electric discharge lamps, and scientific research is being concentrated on their development, as well as on the application of fluourescent materials to light sources.

Fluorescent Lighting

Surfaces can be painted with certain chemicals which are invisible or colourless to the human eye in white light, but when ultra violet rays (sometimes described as "black" light) are projected on them, they become visible as coloured surfaces. Luminescent powders are manufactured in two main types, fluorescent and phosphorescent. The former, which are available in a wide range of colours, will only function when actually activated by ultra violet light. Phosphorescent powders, however, while fluorescing brilliantly in the presence of ultra violet light, have the property of storing luminous energy and will continue to glow for a considerable period after the activating light has been cut off.

A good deal of experimental work has already been carried out with such materials with reasonably successful results, but this form of illuminant is in its infancy. Nevertheless, these are potential light sources of the future, and they are, even now, applicable for purely decorative effects.

It is difficult to convey an adequate impression of decorative electric lighting effects in a verbal description. Photographs are helpful to a degree, but they fail to reproduce the subtle tone and colour values of the subject. For instance, the floodlighting of Hampton Court Palace is an excellent example of the introduction of colour lighting to accentuate the red brickwork in contrast to the stonework of the façade. The picture of the private garden shows that charming effects can be obtained for quite a modest outlay, while the ballroom of the Grosvenor Hotel, Edinburgh, illustrates the application of decorative fluorescent lighting in combination with tungsten lamp fittings. On each of the twelve beams of the coved ceiling triple units of fluorescent tubes provide a gay touch of colour, the combination consisting of two gold tubes and one pink, giving a warm quality of light in harmony with the colour scheme of the room. The various forms of interior decorative treatment show mainly silhouette effects against an illuminated background. The introduction of tinted mirror glass provides added interest by reflection and enhances the appearance in daylight.

Illustrations are, however, quite inadequate to convey to the mind's eye the possibilities of electric lighting as a means of decoration. The most that can be expected of them is that they will encourage an observant faculty and help the observer to formulate original conceptions based on actual examples by which we are surrounded. The technicians are providing the ways and means and, therefore, the opportunities for the decorative artist to exercise originality in their application.

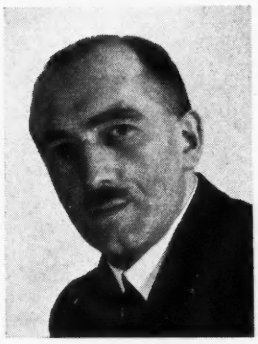
Light in Advertising

By H. S. Scott

Problems in connection with outdoor, decorative and display lighting

Simplification of display lighting, with more artistic grouping of motifs and an improved sense of colour values has emphasised the need for co-operation between architects an sign manufacturers

INTEREST in external illumination in all its forms has grown considerably during the last few years and it is pleasing to note that it is becoming definitely accepted that a building, whether a theatre or a cinema, or a commercial or municipal structure, must have some definite scheme of treatment. Foremost among the media available, the luminous discharge tube (or neon) display is now regarded as the most adaptable and as allowing the greatest originality in treatment. A trend of design in connection with various forms of lighting would appear to be in the direction of simplification, with more artistic grouping of motifs, together with a greatly improved sense of colour values, and architects have now become more alive to the use of neon tubing as a culminating feature of their designs, instead of forming, as it did in the past, an auxiliary form of applied decoration. Apart from the enhanced artistic effect obtained this change has considerably assisted the display erector, as many technical difficulties have, at the same time, been swept away.



Mr. H. S. Scott, manager of Strand & Interchangeable Signs, Ltd.

Architects are beginning to realise the necessity of making due provision for the proper accommodation of the neon tubing and its associated electrical equipment, and the problem of concealing unsightly transformers and other equipment has become far less difficult as the result of the co-operation of architects in the design stages. The sign display makers have also been able greatly to improve their methods of construction and fixing, and the maze of supporting ironwork which seemed to be a necessary evil in connection with the erection of a sign has almost become a thing of the past.

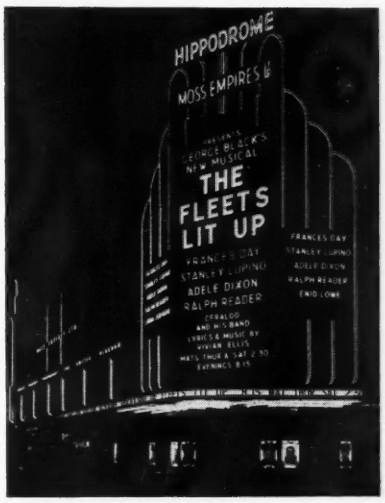
More Rational Treatment

The flat façade of the modern type of building has greatly assisted the neon scheme designer, and the old idea of outlining every projection and window opening, in combination with a multiplicity of intricate curves, has almost completely died out. The treatment of an old building now seems to be far more rational than in the past, but whether this is due to the influence of the architect in connection with his modern design is difficult to say. Without doubt the realisation of the long-desired co-operation of architect and manufacturer has had its effect, and many difficulties which still present themselves will in due time disappear, as the requirements of the sign makers become more and more understood by architects.

The element of restraint in modern neon design, which is most welcome, has appeared almost simultaneously with the introduction of more delicate colours, often referred to as the pastel shades. Fluorescent tubing, which is now available in many shades, has given an enhanced interest to even small displays, and the grouping together in parallel lines of these tubes, with due regard to colour selection, has produced effects of the most artistic nature and has assisted the sign manufacturer in producing striking and original displays. The brilliant qualities of these particular tubes are not affected when applied to buildings which are already floodlighted. This is an interesting point, as so many of our public buildings are illuminated in this way.

Maintenance Simplified

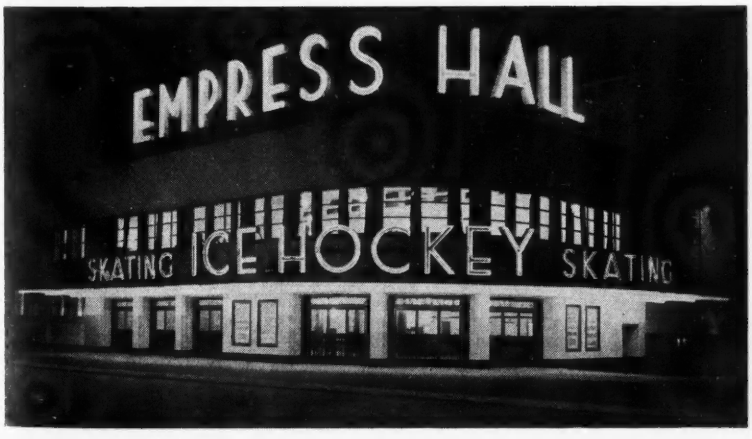
One of the difficulties, namely, the low illuminating value of neon, except during the dark hours, has been almost completely overcome by the introduction of these brilliant tubes, as even in bright daylight they have a distinct attracting value. There is every indication that the future will produce an increasing number of designs of this character, which, apart from their above-mentioned advantages, are more easily maintained. The replacement of tubes at very short notice has always been a matter of anxiety to the makers, particularly in the case of intricate schemes, and delays, although unavoidable, have often led to bad feeling between the user and the supplier. Difficulties of this nature will be less likely to occur when the modern type of display is more generally adopted.



A dignified scheme at the Hippodrome, London, combining neon, fluorescent tube letters and l.v. lamp letters

Passing from the general scheme to the advertising letter sign, we again note considerable changes, all of which make for greater dignity and lessen the possibility of monotony. The advertising value of these signs increases considerably when due consideration is given to the character of adjacent signs. Frequently we now find that the architect, in co-operation with the sign maker, designs his building so that the sign will be entirely behind the building line, thus satisfying the local authorities and avoiding the necessity of application being made for dispensation from bye-laws. Again, due care and forethought has in many cases enabled the sign erector to place his transformers behind the frame or projecting masonry and thereby produce, not only an atttractive sign, but one more worthy of the traditions of his trade. The future will no doubt see more improvements in this direction and it is hoped that the sign manufacturer will be one of the first consulted when a building is being designed.

The use of banks of straight fluorescent neon tubing behind letters has now been in vogue for some time, and such forms of illuminated publicity are not only most effective, but have many applications. For such particular purposes as in theatre or cinema canopies, where it is necessary to change the display valances frequently, no better form of advertising can be suggested. Often the whole of the objectionable features of electrical equipment can be housed above the canopy soffit and, if suitable traps are provided, can be easily maintained. The difficulties associated



An equally striking effect by night or day is produced at the Empress Hall, Earls Court, by using neon metal letters faced with special silvered glass mirror

with earlier forms of canopy neon lighting were considerable, but canopy designers are now aware of them and make provision accordingly.

Backgrounds for letters and outlining often now consist of flat vitrolite or metal panels without the employment of any painted outline behind the tubes. This is rendered possible by the fact that many neon displays are now alight by day as well as night and fluorescent tubing is now generally used in the manufacture of the letters. Greater neatness is frequently obtained by using this form of display as the electrodes at the end of the letters can be returned into the panel and connection made from behind. This applies likewise to the metal letters where the tube is recessed, and in the case of very large letters it is often possible to house the transformers in the letters themselves.

Use in Daytime

Greater consideration appears also to have been given during the past year or so to the question of supplying letters which are effective by daylight when the neon tube is not in operation. Signs have appeared throughout the country with surfaces such as "Staybrite" steel, anodised aluminium and special fluted silvered glass, which meet the desires of the customer and incidentally remove one of the difficulties of the manufacturers when signs with a daylight value are required.

The demand for originality has led to the re-introduction of the lamp letter in various new forms. Although the old familiar lamp letter is still in evidence we find letters combining neon tubing with low wattage lamps coming into prominence. Possibly the high current consumption of the old lamp letters, when compared with the neon letter, was greatly responsible for this type of letter falling into disfavour. The introduction of the low-wattage lamps made possible by the number of districts now changing to a.c. has solved an important problem and, apart from the great reduction in the amount of current consumed, the sign letter, either with a single or double row of lamps, has a far neater and more attractive appearance. Considerable advances may be expected in the near future in connection with this type of display.

As mentioned in connection with straight neon schemes we now find that the grouping of tubes on the surface of backing letters is becoming more evident, and by combining suitable colours the effect is very satisfactory. Furthermore, the more modern letters are being treated in quite an original way by mounting one or more tubes on the sides of the letters. It is not difficult to visualise the effect and to appreciate the increased advertising value when this type of lettering appears in the vicinity of the older types. The problem of the sign manufacturer, to offer his client something distinctive appears to be more easily solved by giving particular attention to the type of display on adjacent properties.

Interchangeable Signs

Interchangeable signs, as used on theatres and cinemas, are now in demand on commercial houses where a frequent change of text is desirable. This demand has been created by the fact that the user can avoid the necessity of purchasing a library of neon letters with its associated large capital outlay, as the letters in various colours are now available on hire, with the service of experienced erectors and complete maintenance. By availing himself of this service the user avoids many difficulties apart from the expense. The question of breakage and regassing is the responsibility of the suppliers, and this would easily become a heavy item if the user purchased and stored a large quantity of letters.

Simple treatment at Drury Lane Theatre employing fluorescent green vertical lines, surmounted by golden crowns

A Matter for the Expert

The maintenance of neon interchangeable letter signs, as well as general neon outlining, is a subject on which much could be said, but it is generally acknowledged that this attention should be left to the expert, if satisfactory and uninterrupted service is to be obtained. Neon displays demand attention, particularly in certain areas, and maintenance contracts are increasing, thus indicating that the future will be more satisfactory, not only from the customer's point of view, but also from that of the supplier.

An example of modern under-canopy tube lighting at the Odeon Cinema, Leicester Square. It is composed of straight and simple curves grouped to produce a bold and effective design with good illuminating properties. Care has been exercised in selecting suitable colours, due consideration having also been given to the height of the canopy from the pavement and to the fact that the soffit can be seen from a considerable distance. In these circumstances the under-canopy scheme forms part of the general scheme on the building and has been treated accordingly

The nature of the neon display is such that slight breakdowns must occasionally occur, and nothing can bring greater disrepute to the sign makers than a number of signs out of action or partially out of order. Most of the principal manufacturers give a guarantee of six months but this should not be confused with maintenance. During the first six months the responsibility for replacing any parts rests on the suppliers, but other attention is desirable in the interest of the customer. When it becomes universally realised that a maintenance service is essential, one of the chief difficulties of the supplier will almost entirely disappear.

Animated Devices

Flashing signs and animated illuminated devices appear to be rather less in evidence than in the past. This is in many districts no doubt due to the fact that the local authorities regard them with disfavour and, in the case of London, they are not permitted when the sign is over the public way. In this direction, also, the architect can assist, in connection with new buildings, by providing space so that the display can be set back.

No doubt at some future date the whole of this subject of intermittent signs will be reviewed and we may look forward to some assistance from the local licensing councils. At the moment there are serious difficulties in the way and frequently any form of moving or flashing display equipment is prohibited.

The use of fluorescent neon tubing, selecting certain colours which are kind to the complexion, for under-canopy lighting, and also the application of "sunlight" tubing, with its pleasing effect in the same direction, are a welcome departure from the old cold white illuminants and have to a great extent solved one of the problems of the illuminating engineer. The placing of neon or tubular lamps behind fancy glass or glass rods, to produce new effects is a field yet to be fully explored and no doubt when further experiments have been carried out we shall see many very artistic, effective and dignified applications throughout the whole country.

The Discharge Lamp

By E. C. Lennox, M.I.E.E.

Its use in public lighting

Mr. Lennox is deputy engineer, Lighting and Heating Dept., North-Eastern E.S. Co., Ltd.

IN recent years the problems of the public lighting engineer have become more and more complex. Apart from the need for lighting capable of providing adequate visibility at long distances, illumination is necessary during dark hours to assist residents in the negotiation of streets, for special purposes in town centres, and to assist police on patrol duty. Not only is adequate visibility at long distances required for the pedestrian, but also for the driver of fast-moving vehicles. It is essential to-day on traffic routes that drivers should see quickly and accurately any object in their path in order to take action necessary to avoid colliding with that object in the few seconds taken to traverse distances of even 200 to 300 yards.

It is now the properly accepted principle, confirmed by the final report issued by the M.O.T. Street Lighting Committee, that lighting of roadways should be such that the use of vehicle headlights is unnecessary. Indeed, their use should be discouraged as the disability glare caused by them in the eyes of oncoming drivers is a definite contribution to the now too heavy accident rate during dark hours.

Adequate visibility at long distances by artificial lighting can only be effectively and economically provided by following the same principles as those employed when one sees distant objects by day. A little observation will convince one that in general the "seeing" of a distant object is by contrast between the object and the background. During daylight hours the amount of normal light falling on the vertical surface of an object must be less than that falling on the road or pathway, and the object is seen in silhouette against a lighter background. There are occasions when the background may consist of a wall or other vertical surface which is somewhat darker than the object, owing to the relative reflective values of the two. In general, however, for an object to be seen by vehicle drivers, with a road or pathway as its background, the public lighting engineer must create "background brightness" to provide good visibility, and he is anxious to make use of the most efficient lighting sources.

"The light output efficiency alone makes the lamp worthy of consideration for every street lighting scheme, and where the lamp is not first considered one may be sure that efficiency of lighting is not the primary consideration."

It is a long way from the carbon filament lamp to the gas-filled metal filament lamp of recent years, giving 9/12 lumens per watt, and the more recent coiled-coil lamp, with its further efficiency increase of up to 10 per cent. Although the improvement in light output has been marked in recent years it has been obvious that the limit of practical efficiency of this type of lamp was being approached and that any further material increase could only be obtained at the expense of reducing lamp life.

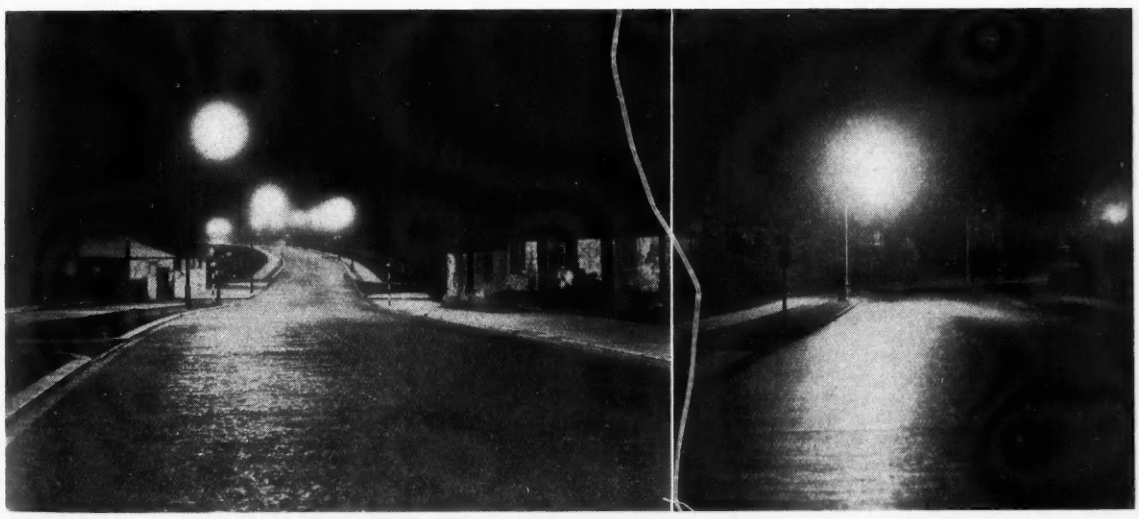
The electric discharge lamp, giving a light output of three to five times as much as metal filament lamps of similar wattage was therefore a welcome addition to the lighting sources available to the street lighting engineer. Although the discharge lamp was introduced for street lighting as recently as 1933, there are now more than 25,000 lighting traffic routes in Great Britain. The light output efficiency alone makes the lamp worthy of consideration for every street lighting scheme, and where the lamp is not first considered one may be sure that efficiency of lighting is not the primary consideration.

Such a new and efficient light source made available for commercial use could not fail to produce new problems. The enormous increase in lumens available in one unit and the concentrated narrow cord of intense light which constitutes the source, made it necessary to produce new lanterns for use with the lamp.

These lanterns were larger and heavier than those previously in general use and required heavier standards and brackets to deal with this added weight and wind resistance. They had to be weatherproof to a greater degree to safeguard the much more expensive lamp against even a drop of water, and new designs of reflectors and refractors were necessary to cater for the very different shape of light source. All these points were adequately dealt with and the resultant effective lighting of roadways was at once the subject of favourable comment. A fact almost immediately demonstrated by the h.p. mercury-vapour lamp was the value of high intensities at high angles in producing a uniform brightness when using normal spacings of 150/180 ft. and a mounting height of 25 ft.

The advent of this lamp revealed the necessity for studying the effects of light distribution and reflectivity on varying road surfaces, and a further result was that the B.S. Specification for street lighting could be considered no longer as a specification indicating the correct method of comparing rival installations, but only useful as a measure of the maintenance of a particular installation. In its place the measure of good street lighting became one of the measure of visibility by assessing the value of contrast between an object and its background.

Sodium lamps, used more extensively on the Continent, have now become well established in this country, and their pro-



Left: Horizontal-burning 400-W mercury-vapour lamps with refractor plate (non-cut-off) fittings, at Whitburn, Co. Durham; 25 ft. mounting, 150 ft. spacing. Right: A bright area formed by a single mercury-vapour lamp in a refractor bowl non-cut-off fitting

duction is not limited to any one manufacturer. The claims made by the makers as to the visibility obtained under their golden light, the lumen efficiency of the lamps and their long life have been substantiated, with the result that trial schemes have been increased and new schemes undertaken. Many of the first schemes made use of cut-off fittings which gave reasonably good results with close spacings of up to 100 ft., but with the greater spacings made necessary for reasons of economy, troughs with reflector panel sides have increased visibility by creating higher and more even road brightness with spacings of up to 150 ft.

Vertical-burning mercury vapour 250-W lamps at Deptford with refractor bowl (non-cut-off fittings); 25 ft. mounting

The mercury-vapour lamp, which has received preference in this country, is generally arranged for burning in a vertical position, in which position the lamp gives its maximum efficiency. Recently, however, the horizontal burning m.v. lamp has commanded attention and lanterns with horizontal burning lamps at normal spacings produce satisfactory intensities at the angles, within a few degrees of the horizontal, necessary to produce the high and even roadway brightness already referred to. It should be realised, however, that similar values of light intensities at similar angles can be and are produced by lanterns using lamps burning in a vertical position and which operate at full efficiency without the use of devices otherwise necessary for magnetic control of the arc.

The Colour Question

The technical problems in regard to the electric discharge lamp were made simple by the manufacturer. The choke necessary to limit the current flowing through the lamp is supplied with several tappings which enable the maximum pressure drop to be allowed on public lighting networks without loss of light output. Condensers supplied give power factor correction to approximately 0.9.

The immediate criticism regarding the colour effect on people's faces and on articles in the shop windows has become less frequent as the outstanding benefits of this form of lighting are increasingly recognised. Any derogatory reference to colour to-day can usually be put down to insidious propaganda by competitors.

It cannot be too strongly emphasised that seeing, even during daylight, is largely a matter of shadow contrast. At night-time when artificial lighting is necessary it is only in exceptional cases that colour contrast is possible—even in the most highly illuminated areas, and only then, when the object is within a yard or two of the observer. The road lighting which calls for most attention to-day is that necessary to meet the present heavy traffic conditions and the efficiency of the whole lighting system must not be sacrificed for its minimum requirement, that of colour contrasting.

A study of the spectrum diagram showing the energy emitted from the high-pressure mercury vapour lamp will indicate that a large proportion is at a wavelength just too short to be visible, it being in the ultra-violet region. By using outer glasses, the inner sides of which have been coated with materials having the property of fluorescence, *i.e.*, the property of absorbing radiation and re-emitting it at a longer wavelength, this invisible radiation is turned into visible radiation. The use of an appropriate fluorescent substance will provide the necessary colour correction. Such lamps are now available and indeed are being used for lighting in the centres of certain towns.

Further developments of the electric discharge lamp include the 80-W and 125-W extra high-pressure mercury-vapour lamp, where although the same principle of electric discharge across mercury vapour is employed, several new features are incorporated. Instead of a discharge tube 7 in. long the 125-W lamp has a discharge of only 1¼ in. long in a vapour pressure of 10 atmospheres.

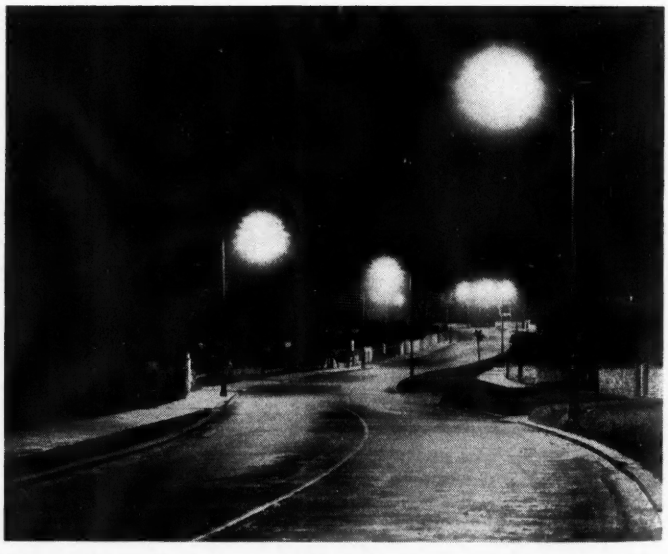
Pure quartz is used for the tube and the whole 125-W unit is enclosed in an outer glass envelope similar to that of an ordinary 200-W metal-filament gas-filled lamp. It is noticeable that this and the similar 80-W lamp emit a colour which contains a reasonable amount of red and so give a better colour rendering than those of larger wattage. The range of electric discharge lamps is now: sodium-50, 65, 100 and 150 W with 2,500 normal burning hours; and mercury-vapour 80, 125, 250 and 400 W with 1,500 normal burning hours. In addition there are the 400-W mercury-vapour fluorescent lamp and the dual-type lamp (which combines a m.v. tube with a metal filament) giving corrected colour. The range is surely all that is necessary for public lighting.

A Comparison of Costs

The lighting engineer must therefore consider the colour, the type of lamp and burning position before he can decide on a suitable lantern, and, furthermore, housing for the choke and condenser in addition to the service, fuses and time switches must be provided. Consideration must also be given to total running cost. Unfortunately, the benefit of the increased life and light output efficiency of the discharge lamp relative to the metal-filament lamp of even wattage is offset by the increased price of the lamp, and the total benefit of the lamp is therefore reduced when the total cost per lamp per annum is considered. This is especially noticeably with the lower wattage lamp, and the accompanying table is prepared to show the make-up of the various costs in a complete annual charge for public lamps.

Type of Lamp.	Loading.	Percentage of total costs for			
		Energy.	Labour.	Lamps.	Equipment.
Metal filament ...	200 W	50	17	17	16
,, ,, ...	300 W	50	13	17	20
Sodium	80 W	27	20	32	21
,, ...	150 W	27	12	40	21
Mercury	80 W	25	18	39	18
,, ...	400 W	45	10	28	17

It will be noticed that for electric discharge lamps the energy charge is a much smaller percentage of the total cost per annum than is the case with metal-filament lamps, and that the cost of the small lamps assumes too high a proportion, if one considers the capital expended by the supply authority in meeting the kW demand, which normally comes on peak, and in providing service from the nearest mains. Any

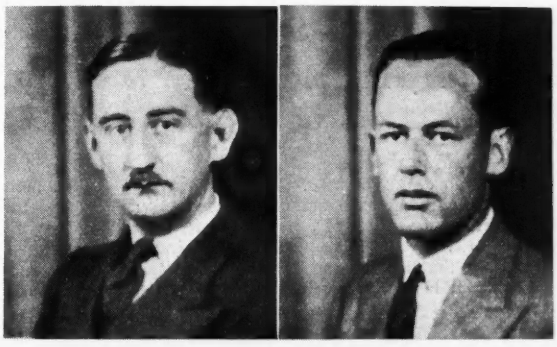


An installation at Worthing: 150-W sodium lamps with refractor plate (non-cut-off) fittings; 25 ft. mounting, 150 ft. spacing

Lighting and Road Development

Securing greater road safety

By C. W. M. Phillips, A.M.I.E.E.
and F. K. Garry, B.E. (Elec.-Civil)



Mr. C. W. M. Phillips and Mr. F. K. Garry, of the Lighting Section of the B.T.H. Company

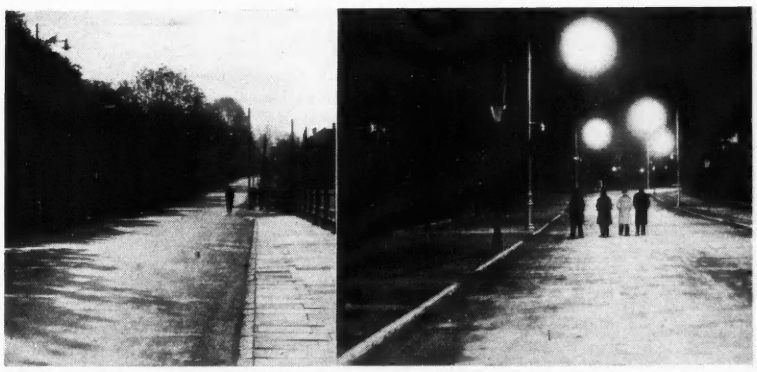
STREET lighting is still very much in its youth as an engineering science, and it would be a bold step indeed to predict far into the future the results which may be achieved. Certain marked trends are, however, quite obvious and it is along these lines that one would expect development to proceed.

The constant public demand for ever-increasing facilities for travel and intercommunication has produced not only large volumes of vehicular traffic of all types upon the arterial roads and through routes, but also a concentration of pedestrian and local vehicular traffic in roads previously almost completely unused.

Responsible authorities throughout the country have been greatly concerned by this tremendous increase in loading upon routes originally designed to carry the small volume of slower-moving traffic which was prevalent even as recently as ten years back. Constant attention is being given to road widening, provision of dual carriageways, new by-pass routes, design of road crossings, pedestrian control, cycle tracks, surfacing materials and many other aspects of road design which materially affect the safety of the individual and his convenience in speedy travel.

" It has been conclusively proved that present-day requirements for main road lighting can be completely filled at a comparatively low cost by a system of lighting of the controlled cut-off type "

Each of these aspects is very closely related to the others and it is rapidly being realised that improvements must be considered, not in isolated directions, but as part of a planned whole. The various Ministry of Transport publications on road construction, layout and surfacing, the Bressey Report on London's particular problems, the researches of the National Physical Laboratory and the developments by interested manufacturers, are all part of a concerted attempt not only to make provision for present needs, but also to cope with future demands.



Left: A roadway in daylight showing that the background is brighter than the objects viewed. Right: Similar conditions obtained at night-time

A few years ago street lighting was required mainly for the prevention of crime and as a guide to the occasional late traveller. To-day roads are rapidly becoming as busy throughout the night as they are in the daytime. If comfort and facility of travel are to remain, the road user must feel that he is quite as confident of seeing by night any obstructions and potential dangers to life and comfort, as he is by day. In other words, night vision must be facile and positive, devoid of discomfort, and must ensure that all obstructions within the danger zone are immediately noticed.

For lightly trafficked roads good headlights will produce this desired effect, but immediately there is any increase in the volume of road users, glare from oncoming vehicles introduces danger and doubt. The true solution to good night vision can be found, therefore, only in street lighting of such a type as will fulfil all the requirements detailed above. Such street lighting then becomes one of the major aspects of road design and safety.

But how may this facile and comfortable vision be best obtained? It is obviously impossible to reproduce completely the conditions obtaining in the daytime. By day, illumination is obtained from a single source of high intensity, suspended at a great height and supplying a certain proportion of direct rays, but assisted by a much larger proportion of completely diffused rays reflected in all directions from dust and vapour particles suspended in the atmosphere. This has the effect of lighting all objects both within the direct field of view and also outside this direct field, to an intensity impossible to achieve at night-time even if ideal economic conditions were obtainable.

Careful consideration of the mechanics of daylight vision on roadways shows that at distances greater than 100 to 200 yards, the main bulk of any obstruction is rendered obvious, not so much by its colour or detail contrast of colour, but by the fact that the surrounds appear brighter than the object. The nature of the object is immediately conveyed to the mind by its general outline, contrasted as an area of low brightness against a background of higher brightness. Further careful examination may show detail, but the object is initially recognised by its silhouetted outline. As the object is brought closer to the observer, an increasing proportion of detail is noticeable at first glance, but the process of recognition still remains the same, first the outline, then the detail.

Since speed of recognition at a distance is required above all by the road user, and silhouette contrast in brightness can be easily obtained, this is the principle which has proved the basis of modern street lighting practice. The problem then resolves itself into the best method of obtaining the requisite effective brightness of background evenly and without sudden gradation, at the same time keeping the object brightness low. The term " effective brightness " is advisedly used, since glare in the field of view immediately raises the level of accommodation of vision of the eye, and so makes the apparent brightness of the background substantially lower.

Considerable difference of opinion still exists amongst certain authorities as to the best method of obtaining this result, the

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The Discharge Lamp (*Continued from preceding page*)

relief by lamp manufacturers in this respect will not only enable advantage to be taken of the lower wattage lamps and assist electricity undertakings in meeting the cut prices of their competitors, but will also stimulate the progress which street lighting has made in recent years.

And what of the future? When one considers the progress made in methods of lamp production accompanied by the increased efficiency even during the past three years (such that lighting authorities who contracted to use electric discharge lamps three years ago now receive an increase in light of over 15 per cent. for no increased running cost); the high value of the colour of the present lamps in contributing towards quick and accurate visibility; the fact that they are well suited for highly effective light distribution; and that there are good prospects of further increases in efficiency and, with regard to the mercury lamp additional colours more nearly in accordance with accepted standards of white light, it is surely impossible to think that these new light sources have not come to stay.

Lamps and Lanterns

By Harold Bright, M.A., M.I.H.V.E.

A survey of recent developments

Recent lighting research work has been centred largely on electrical discharge lamps, special lanterns designed for use with them, and fluorescent lighting.

SINCE the introduction of the coiled-coil lamp there has been no development of importance in tungsten filament lamps with the exception of bi-post mounting for projector pattern bulbs designed for use in lanterns where filament position is critical. This method of mounting has the further advantage that contact over-heating difficulties do not arise.

Considerable research work is, however, being carried out in connection with electric discharge lamps. The 400-W mercury discharge lamp, with its bulb coated with luminescent powder, has made its appearance, but this type of lamp is not yet available in this country in lower wattages. A similar 400-W lamp is produced with the large isothermal bulb, designed to allow for more satisfactory cooling and so prevent disintegration of the coating by excessive heat. Mercury discharge lamps are now available in wattages as low as 80, and sodium lamps as low as 50. The effective burning life of the small sodium lamps is 2,500 hours as against 1,500 hours for the mercury type.

Mr. Harold Bright is a well-known consulting engineer

Allowing for the cost of the lamp and stabilising choke or transformer, it is hard to make out a case for the small lamps on the score of economy, unless the kWh charge for electricity is high. Where, however, it is desired to improve the colour of tungsten light or to produce other special effects, they may be used with great advantage. The lower wattage mercury lamps should, therefore, command a more ready sale when they appear on the market with coated bulbs, as the effect of the coating is to raise the red content of the spectrum from less than 2 per cent. to 6 per cent., making a marked difference in the colour rendering.

Although in the majority of cases the unnatural colour of the light from electric discharge lamps is a disadvantage, for certain industrial processes these lamps are being used because of the increased contrast which may be obtained with this form of illumination.

Typical examples of these industrial applications are afforded by a steel chain factory where small flaws in the chain links may be more easily seen; coal picking plant where the shale is more readily distinguished from the coal; and laundry ironing rooms where scorch marks are much easier to see than they are under any form of tungsten lighting.

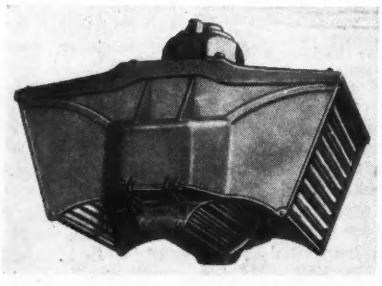
The 80- and 125-W mercury lamps are now available with bulbs which are opaque to the whole spectrum except a portion at the ultra-violet end so that no visible light is emitted. These "black" lamps are useful for stimulating luminescent powders and they enable some remarkable decorative effects to be achieved. They may also be used for the detection of invisible laundry marks made with inks containing luminescent materials, whilst a further application is for industrial inspection work and for various research purposes, including criminology, as certain marks which are invisible in ordinary light can readily be detected by being subjected to ultra-violet illumination.

In Switzerland a tungsten lamp having a useful burning life of 2,500 hours has been developed, this increase in life being obtained at the expense of efficiency, which is about 85 per cent. of normal. In certain types of street-lighting installations it has proved its economic value by the saving in labour required for maintenance. In Germany, coiled-coil

Lighting and Road Development (*Continued from preceding page*)

problem being further complicated by economic considerations. Local bodies even to-day are handicapped to a large extent by lack of funds, and a more general recognition should be given to the fact that, as with all other types of engineering practice, installations provided at the lowest initial capital cost are, as a rule, by no means the most economic over a period of years. True economy is to obtain the maximum results per pound of outlay over the whole life of the road.

In 1935 there was outlined[1] a subjective method of assessing the value of any given lighting installation, taking into account the influence of all relevant factors upon groups of observers under normal conditions in practice. As a result of surveys using this method, combined with a careful study of the economics of the problem and the practical difficulties experienced in the various types of installations, it has been conclusively proved that present-day requirements for main-road lighting can be completely met at a comparatively low cost by a system of illumination which incorporates controlled cut-off distribution.



A "B.T.H. Mercra H 320" lantern with controlled cut-off distribution

"Controlled cut-off" implies complete control in all planes of the output from the light source used. By this means the maximum use is made of the light available even under the most adverse circumstances, and despite the fact that the light source remains visible, glare is non-existent. Since the control is arranged to suit known conditions of spacing, mounting height and road design, this system has the advantage over both the "cut-off" and "non-cut-off" types of installation of flexibility to suit changing conditions, so that no wastage is experienced no matter what these conditions may be.

The Departmental Committee's Report to the Minister of Transport,[2] after setting out evidence from all sources, indicated briefly the existing practice regarding the application of lighting units to meet present requirements, and designs of suitable equipment of the controlled cut-off type have also been recently described.[3&4] It is not the purpose of this article, therefore, to enter more fully into a discussion of the details of present practice.

Careful study of recent history, however, would indicate that within the next few years co-ordination in road design will become increasingly more apparent. Standardisation of layout, the provision of wide arterial roads carrying unidirectional traffic, division of traffic types including pedestrian, and greater facilities for crossing streams will all be introduced, and, above all, lighting will form part of the planned design.

There will be recognised classes of roads where headlights may not be used, others where headlights are optional,[5] and some where they will always be necessary. Street lighting schemes will no longer be regarded as an isolated item, to be provided haphazardly as money is available. The road will be designed to fit the lighting, just as much as the lighting to fit the road.

It is to be anticipated that, as time goes on, mounting heights of main-road installations may increase, spacings between units will decrease, and in the interests of uniformity of lighting and glareless comfortable vision, controlled cut-off distribution will be generally adopted.

With the constant improvement in the efficiency of light sources, the outputs from individual units will increase and the search for safety and consistency will give increasing prominence to the importance of highly trained and experienced lighting engineers to co-ordinate the design and layouts of lighting over large areas.[6]

New conceptions of road construction will introduce special problems of lighting layout and equipment design, and existing roads will have to be lighted to fit their existing layout, but the basic principles at present in use appear so fundamental that it is most unlikely that they will undergo any radical changes for many years to come.

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[1] "The Importance of Kinematical Factors in Roadway Illumination," by Davies, Maxted & Lucas. A.P.L.E. Conf., Sept., 1935.

[2] Ministry of Transport Departmental Committee on Street Lighting. Final Report, Aug., 1937.

[3] Horizontal Street Lanterns—Maxted. ELEC. REVIEW. May 13th, 1938.

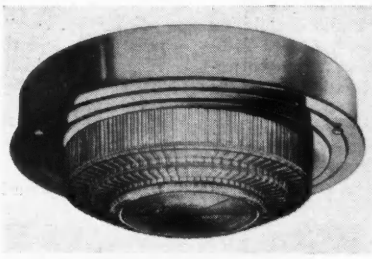
[4] Horizontal Discharge Lamps—Maxted. ELEC. REVIEW. Feb. 28th, 1936.

[5] Ministry of Transport Departmental Committee Report on Street Lighting—Final Report Aug. 1937. Sect. III—Classification of Roads.

[6] Some aspects of the Ministry of Transport Report on Street Lighting—Lucas (B.T.H. Co.) RLP.137, June, 1938.

construction is applied not only to general service lamps but also to decorative lamps of the candle type.

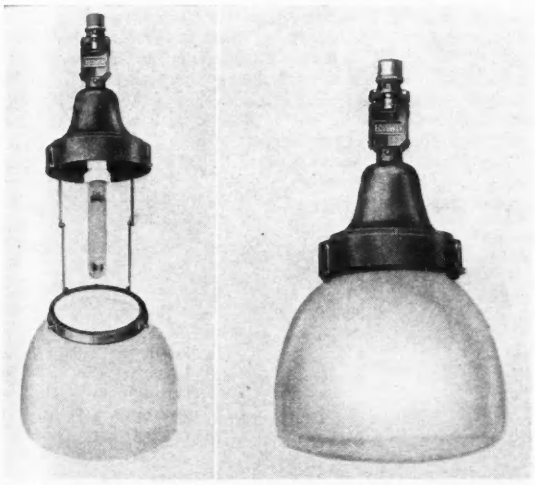
The introduction of coated mercury lamps of from 15 to 30 W has been announced in America, and it is stated that these will be available with various types of coating in order to produce different colour effects. Water cooled mercury lamps have appeared experimentally and have a consumption of from 200 to 500 W. The tubes containing the light source are of extremely small dimensions and these lamps may find application for studio and projection work where optical control of the beam is required. The 500-W water-cooled sodium lamps are being used in small searchlights of medium range, the cooling being obtained in most cases from self-contained circulating pumps. The combined tungsten and mercury lamp enclosed in the same bulb is still being much used; this is the only lamp of the electric discharge type available for use on direct current.



A built-in ceiling fitting (Holophane) with stepped prismatic bowl. The circular lens at the bottom is removable for relamping

Turning to a consideration of lanterns and fittings we find a large number of street-lighting units designed especially for the new discharge lamps. These may be divided into two classes—those using vertical or horizontal lamps. Improvements in the heat-resisting glasses from which the bulbs are manufactured have enabled magnetic deflectors to be dispensed with in the latter type. There is still a demand for lanterns of both the cut-off and non-cut-off types, and both of these are available in all sizes. Lanterns used for the 125- and 80-W discharge lamps do not vary appreciably from those using tungsten lamps. In the case of fittings for use with high wattage lamps, more attention is given to adequate ventilation of the lampholders so that contacts and leading-in wires are not subjected to excessive temperature.

Most manufacturers are now offering industrial lighting units of the over-lamp type, and some are available in which the reflector, complete with lamp and holder, may be removed from the suspension rod for cleaning. Floodlight fittings in sizes up to 1,000 W of flameproof construction (Buxton Certificate Class 2) are now available and are being used extensively in petroleum refineries. There is also a full range of flameproof pendants for use with the small electric discharge lamps. Enclosed lanterns for railway station lighting and similar duties are now produced in patterns which are easier to keep clean. In connection with station lighting, the tendency is to allow more light to reach the roof than hitherto in order to avoid a depressing effect.



An "Ediswan" industrial lantern for 1,000-W tungsten lamps or 400-W mercury electric discharge lamps. A special device is fitted to hold the globe in a dropped position during cleaning

Anodised Aluminium Reflectors

The use of anodised aluminium as a reflecting surface is rapidly extending. The metal may be finished with a matt or specular surface, in the latter case the efficiency being over 90 per cent. that of mirrored glass. Furthermore, its resistance to heat is better and the reflectors are, of course, unbreakable. By employing dyes in the anodising process coloured matt surfaces may be obtained, and it seems likely that this may be of use in controlling the colour of the light source. It is of interest to note that matt surfaced aluminium forms one of the most efficient reflectors for u.v. light.

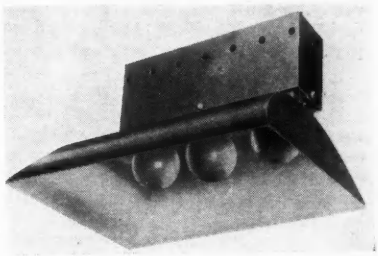
A new type of opal glass, which has a sharply absorbing band in the yellow portion of the spectrum, has appeared on the market and is available in various types of fitting for domestic and industrial use. The glass contains neodymium oxide and it is claimed by the manufacturers that objects lighted by lamps contained in these fittings present an enhanced appearance, and that although visibility is improved, eyestrain is reduced. Unfortunately, however, this glass cannot be blown and fittings made from it have to be moulded.

In shop window lighting the only outstanding development is the use of a mixture of tungsten and mercury lamps, and several firms have produced fittings designed for using both types of lamps in combination. The usual proportion is from 150 to 300 W of tungsten to each 80 W of mercury.

A novel device for controlling the light output of an electric lamp appeared on the market some time ago, consisting of a prismatic glass ring. The effect of the ring is to increase the amount of light thrown downwards at the expense of the lateral distribution. A range of fittings has been produced in which it is incorporated.

New Uses for Neon Tubes

High voltage luminescent tubes are now being used for their lighting value as well as their decorative effect. Combinations of red and green, or gold and white tubes are commonly used, the overall efficiency being of the order of 18 lumens per watt. Apart from the saving in current consumption, the reduction in heat output is of considerable importance in many types of installation, such as restaurants and even engineering works gauge rooms. This method of lighting has also been successfully applied to railway stations.

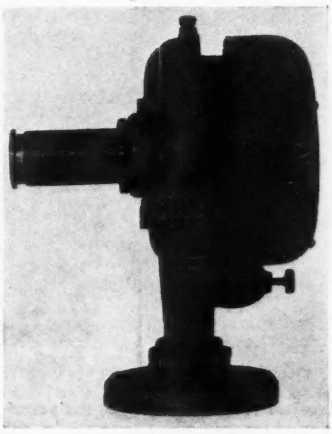


A shop window reflector (G.E.C.) for combined tungsten and mercury lighting. Two 150-W tungsten lamps and one 80-W electric discharge lamp are housed in the fitting

The useful life of the tubes is from 3,000 hours upwards. If used in concealed cornices, etc., the capital cost of tube installations is considerably higher than those using tungsten lamps. In many cases the tubes may be installed so as to be visible on the surface of the ceiling as owing to their comparatively low instrinsic brilliancy there is no glare. In this case the capital cost is frequently very much less than for tungsten lamp installations, for which decorative fittings are needed.

Light-actuated relays are being used extensively for the control of street lighting installations, and a new light-actuated switch is being marketed which will handle loads up to 200 W directly without the use of relays or contactors. An interesting application of light control has been applied to petrol filling stations, where the garage is lighted up on the approach of a car, the effect being secured by means of a photo-cell device.

The use of miniature spotlights for the lighting of pictures in private houses is increasing and a number of types have now been produced. The latest is provided with geared swivelling and tilting movements for accurate positioning of the lantern and an adjustable masking device to enable the beam to be made to fit the edges of the picture. The lamps used, which are usually operated at 12 or 24 V, consume from 24 to 100 W.



Picture lighting projector with worm-operated tilting and swivelling movements and an adjustable mask

D

The Radio Exhibition.—II.

By W. E. Miller, B.A. (Cantab.), M.I.W.T.

VISITORS to the thirteenth National Radio Exhibition which opened at Olympia on Wednesday, August 24th, and closes to-morrow (Saturday), cannot fail to be impressed with the fact that television is at last beginning to take its rightful place in the broadcasting scheme, even though, as pointed out a fortnight ago, the service area is still confined to the neighbourhood of London. On the transmission side, there is abundant evidence that the British Broadcasting Corporation is making every attempt to popularise the new art, and to provide longer and better programmes.

During the run of the exhibition the programmes transmitted from Alexandra Palace have been augmented, many of them emanating from the studio in the exhibition, which is attracting large numbers of the public who wish to get some idea of the technique involved in television transmission. On the receiving side, no fewer than twenty-two concerns are showing complete television receivers of one kind or another, while many others have exhibits in which cathode-ray tubes, valves, aerials, and accessories specially designed for television take a prominent part.

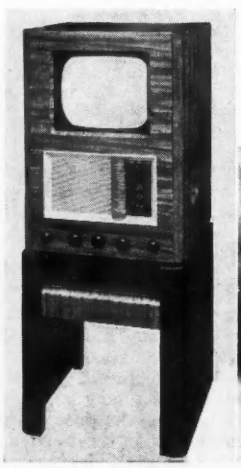
A section of "Radiolympia"

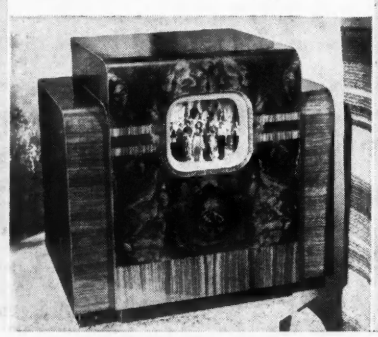
Television Receivers

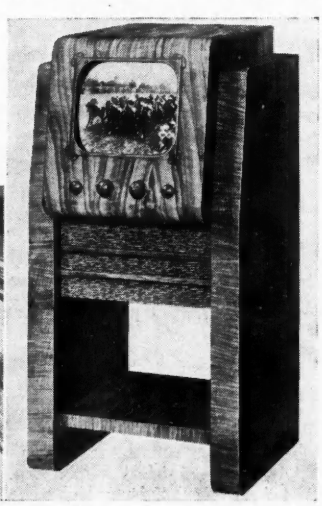
Dealing first with receivers, these fall into two main classes—those employing cathode-ray tubes viewed directly or *via* a mirror or lens, and giving picture sizes varying from 4¼ in. by 3¼ in. (5 in. tube) to 13½ in. by 11 in. (15 in. tube); and those using projection cathode-ray tubes or mechanical-optical scanners, giving "large screen" pictures ranging in size from 18 in. by 15 in. to 24 in. by 20 in. A Scophony model, for cinema work, gives a picture 6 ft. by 5 ft., but of course does not come into the category of home receivers.

Mention should be made at this point of an interesting novelty exhibit on the H.M.V. stand, known as the television "monocle." It consists of a miniature cathode-ray tube and telephone earpiece, fitted into a holder not much larger than a standard telephone hand set, in which a television picture can be seen and the sound heard.

Apart from the wide divergence in picture sizes, there is a considerable variation in the forms in which the receivers are marketed. There are some which provide the vision only, and have an adaptor arrangement whereby the accompanying sound is obtained from an existing audio receiver; others provide the vision and sound only; while another group contains, in addition, an ordinary all-wave audio chassis, which may also be provided with means for gramophone record reproduction and, in some cases, an automatic record-changer.







1. The Baird table model television receiver giving a 10-in. by 8-in. picture and including a four- wave-band radio receiver. 2. The Pye vision-only receiver. It has an adaptor whereby the ordinary broadcast receiver is used to provide the sound. 3. An Ultra console television receiver giving a 10-in. by 8-in. picture and accompanying sound

Naturally, the "vision only" models come into the lowest-price class, and the least expensive of all is the Pye 817, at 21 guineas, which gives a 4¼ in. by 3¼ in. picture. This is closely followed by a similar Invicta model at 21½ guineas.

The lowest-priced model giving vision and sound is the Cossor 54, which provides a 5-in. by 4-in. picture and is priced at 23 guineas. The Murphy A56V, at £30, gives a 7½-in. by 6-in. picture, while the G.E.C. BT9121 gives a 10-in. by 8-in. picture, its price being 37 guineas.

The Pye 819 is the lowest-priced model including an ordinary radio (medium and long wave) chassis, at 28 guineas, but it is closely followed by the Marconiphone 706 and H.M.V. 904, with all-wave radio chassis, at 29 guineas.

Apart from the low-priced receivers quoted, in which economies have been made in circuit design so that the specification is about the minimum which is able to give satisfactory picture reproduction, there is a wide choice of models in which price has been of secondary importance, and there are plenty of models giving 10-in. by 8-in. pictures, with all-wave radio or radiogram chassis, at prices from £50 to £120.

"Large-screen" receivers are being shown by Baird, E. K. Cole, H.M.V., Marconiphone, Philips, Pye and Scophony. Most of these are of the projection cathode-ray tube type, but the "Ekco" and Scophony models use a mechanical-optical system in which the light from a high-pressure mercury lamp is modulated by a supersonic light valve, passed through a mechanical scanning system, and projected from the rear on to a flat screen measuring 24 in. by 20 in. A black and white picture is produced, and the price of the instrument is 220 guineas.

Most of the projection tube types give a green or yellowish-green tinged picture. Baird, however, have a tube which gives a substantially black and white picture. It should be pointed out that in a projection tube a very high anode voltage (25,000 V) is used to obtain a picture bright enough to be projected, and most screen materials capable of withstanding the intense electronic bom-

bardment involved happen to give a yellowish-green light. The Philips receiver, the Tel 61, giving an 18-in. by 14½-in. picture, with all-wave press-button radio, is priced at 120 guineas, and is the lowest priced of all the large-screen models.

The general tendency this year, at least in the moderately priced television receivers, is for the use of magnetic cathode-ray tubes, rather than electrostatic ones. The new "Ediswan" 9-in. magnetic tube (CRM91) is an example of this, and its length is only 14 in., so that receiver cabinets in which it is used need not be very deep from front to back. On the other hand, however, since the tube is short, the cathode-ray beam must be deflected through a greater angle than is the case with longer tubes, and this necessitates a greater output from the time bases, together with rather careful design of the deflection coils. Nevertheless, certain manufacturers are still using the electrostatic type of tube, particularly in their larger models.

On the whole, controls have been simplified so far as the ordinary user is concerned. There is often no tuning control, and picture brightness or contrast, and sound volume are frequently the only two controls provided within normal reach of the user. Naturally, several pre-set controls are still provided inside or at the rear of the receiver, but once the set has been correctly installed, these will only require adjustment after long periods of use.

Cathode-ray tubes figure on many stands, being shown by Edison Swan, Mullard, G.E.C., Cossor, Hivac, Baird, and Vacuum Science Products. The "Ediswan" exhibit includes five tubes, in separate booths, running from a single receiver. The tube sizes range from 9 in. to 15 in. Vacuum Science Products are showing an interesting specialised tube which enables a still picture to be transmitted to a television receiver for testing and adjustment.

Before leaving the subject of television, reference should be made to the exhibits of special aerials and feeders for television by such concerns as Belling-Lee, E.M.I. Service, Antiference, Ltd., and the Telegraph Construction and Maintenance Co., Ltd. Special components for television are shown by Dubilier and T.C.C. (high-voltage condensers), Belling-Lee (high-voltage valve-holders and connectors), Bulgin (connectors, tube-holders, &c.), while most of the valve manufacturers show types which have been developed specially for various uses in television receivers.

Left: This McMichael receiver uses push-button permeability tuning for six stations. Right: A moulded cabinet is used for this Ferranti all-wave battery receiver

1. The Murphy motor-driven automatic tuning radio receiver. Fourteen different stations can be selected, seven on medium and seven on long waves, while an easy system is adopted for short-wave tuning. 2. The Cossor dial-operated automatic tuning receiver. 3. The G.E.C. "A.C. Touchtune 5" radio-gramophone with press-button tuning for five stations.

Turning now to ordinary radio receivers, even a casual inspection of the exhibits at "Radiolympia" indicates that this year manufacturers have something really new to show to visitors, and that is automatic tuning. There is hardly a stand showing receivers which does not include a range of push-button, lever, or dial-operated models, and on all sides are exhibits designed to show the visitor how the various systems work. In many cases manufacturers are each employing several systems in different models.

Starting first with the simple dial-operated mechanical systems, these are shown by Cossor, Ultra and British Belmont. In this type of receiver the finger is placed in a hole in the dial and pulled round, thus rotating the tuning condenser, until a selector pin falls into a slot or gate, locking the dial in the correct position for the selected station.

Next come the mechanical press-button or lever systems, which are available in many ingenious forms. Concerns showing these types of receiver include Alba, Burndept, Mullard, Philips, Pilot and Vidor. In most of these some mechanical arrangement is used to convert a direct push on a button or lever into a rotary movement of the tuning condenser. The Mullard and Philips systems are unique in that a special tuning condenser has been designed whose capacity variation is achieved by a push-pull action, and which is linked up to the station selection buttons by adjustable push-rods.

By far the greatest number of automatic-tuning receivers are of the pre-tuned type, in which the pressing of a button or the rotation of a switch bring into circuit small pre-adjusted tuning condensers, or permeability-tuned inductances, for the various selected stations. Concerns such as Armstrong, Ferguson, Ferranti, G.E.C., Higgs, Invicta, K.B., Pye and Ultra use the condenser type of pre-selection; Belmont, Cossor, E. K. Cole, H.M.V., Marconiphone, McMichael and Regentone use the permeability method for pre-tuning, while Beethoven and Bush use a combination of the two types, with condensers for the aerial circuits and permeability-tuned coils for the oscillator circuits.

In a few cases, sets using the pre-tuned system are available without provision for manual tuning at all, such models being shown by Beethoven, Bush and Invicta. In all other automatic receivers, however, manual tuning is incorporated in addition to the automatic system.

Motor-operated Tuning

The final class of automatic tuning receivers is the motor-driven type, which is shown by Belmont, E. K. Cole, Ferguson, H.M.V., Marconiphone, McMichael, Philips, Murphy, Regentone and Radio Gramophone Development Co.

In the case of some of the "Ekco" and R.G.D. models, not only is the tuning condenser driven round to the correct position for the selected station, but the waveband is automatically changed, if necessary, while R.G.D. and Regentone also have provision for remote control of the receiver. In the case of R.G.D., a control unit is linked to the receiver by a cable, but the Regentone system is unique in that the control box can be connected to any electric point in the house, and controls the receiver by d.c. impulses on the a.c. mains, to which, of course, the receiver itself is also connected. The set can thus be controlled from any room in which there is an electric point.

Many of the motor-driven receivers have what is known as "cruising" controls, by which the motor drives the condenser round as long as a button is depressed, final manual adjustments being carried out by the usual manual tuning knob.

In practically all automatic-tuning systems provision has been made for easy and speedy changing of the selected stations to suit the user's requirements. Automatic frequency control, an electrical method for securing accurate tuning of a selected station, is incorporated in many of the motor-driven receivers.

The exhibition reveals that battery operated receivers are still being produced in reasonable variety, while one firm (Milnes Radio) is showing a set operating entirely from gas.

Although most of the receivers shown are priced around the 9- to 15-guinea class, there are some costing much less than

this, for example, the Belmont a.c.-d.c. midget at 4 guineas. On the other hand, the luxury class of receiver and radio-gramophone is well in evidence, such concerns as Autotrope, Dynatron, Keates-Hacker and R.G.D. catering for this market.

Accessories and Equipment

Loud speakers continue to be improved in detail, and Celestion, Rola, Goodmans, Tannoy and Whiteley Electrical are showing new models. Goodmans have some interesting large-power auditorium models, while Whiteley Electrical is showing extension types built into tables, and in special triangular section cabinets for hanging in the corner of a room.

Public address equipment is strongly featured on many stands this year, including E.M.I. Service, Tannoy, Morris and Co. and Rothermel (microphones). Tannoy have applied sound amplification to a wide variety of industrial purposes, and among the interesting equipment shown is their power microphone, which runs from an l.v. supply and feeds directly a loud speaker, no amplifier being necessary. The speaker largely used for this purpose is known as the "Co-Ax," incorporating a bowl-shaped re-entrant horn which is easily fitted to cars and even bicycles, and is suitable for traffic control or similar purposes.

Service and production-testing equipment is very prominent, and in many cases cathode-ray oscilloscopes are shown in operation for receiver alignment, waveform delineation, and so on. Concerns featuring this equipment are the Automatic Coil Winder and Electrical Equipment Co., Bulgin, Cossor, E.M.I. Service, Everett Edgcumbe, Ferranti, Salford Instruments, A. H. Hunt, Marconi-Ekco Instruments, Mullard, Pye, Norman Rose and Weston.

Battery charging plant is shown by Edison Swan, Westinghouse and others, while the battery concerns represented include Britannia Batteries, Chloride, Fuller, G.E.C., Siemens, Sterling and Vidor.

For the first time a complete section of the exhibition is devoted to pianos and other musical instruments, in which nearly two dozen well-known companies have stands.

Annealing Furnaces at Rotherham

Electrification of a steel-strip works

COLD rolling and bright annealing of steel strip of all grades is carried out at the Eastwood Mills of Ben. Bennett (Jnr.), Ltd., at Rotherham, which have a weekly output of 180 tons, ranging from ⅜ to 14 in. wide by 0.004 up to ⅜ in. in thickness.

The electrification of these mills was undertaken by the General Electric Co., Ltd., to the instructions of W. Brealey & Co., Ltd., Ecclesfield, who acted as consultants for the scheme. Three-phase a.c. is delivered at 400 V, 50 cycles, and the equipment includes two 2-ton hoists, all the motors being of standard protected slip-ring design.

There are six two-high cold-roll mills, each driven by one 100-, two 50- and three 40-h.p. motors. The larger machines are controlled by contactor starting panels, which are arranged for remote push-button actuation. Each panel is housed in a sheet-steel cubicle and embodies a main stator contactor together with the rotor accelerating contactors, which are controlled by a timing relay to ensure that the motor is started in the shortest time compatible with safety. An ammeter is mounted on the top of each cubicle. The starting equipment for the 40-h.p. motors comprises an oil-immersed stator switch and an electrically interlocked oil-immersed rotor starter of the hand-operated type.

A general view of the rolling mills, showing in the foreground one of the two G.E.C.-Grunewald electric furnaces and in the background the cold rolling mills

The three cluster mills are driven by 50 h.p. motors, the starting equipment being similar, while for the four-high mill two motors rated at 40 and 50 h.p. are installed and provided with contactor type starting panels.

The two G.E.C.-Grunewald electric furnaces for bright annealing the cold rolled steel strip are designed to accommodate coils up to 24 in. in diameter, producing a uniform untarnished finish. They are of the vertical cylindrical type, fitted with nickel chromium heating elements in spiral form; sixteen annealing pots of heat resisting alloy (each with its cast base plate and suspension rods hanging from the cover); the necessary switchgear and automatic control equipment; and a G.E.C. gas burner for providing the requisite artificial gas atmosphere. The total loading of each furnace is 60 kW.

The coils of steel to be annealed are first stacked up on the base plate to a height of about 5 ft. 6 in. Next, the thermally insulated cover is placed in position above the charge, and the suspension rods which hang from it are attached to the base plate. The whole assembly of base, rods, cover and charge is then lifted and placed in the annealing pot; sealing is effected by means of a water-cooled rubber ring between pot and cover.

The loaded pot is then placed in a recuperation trench. Here the charge is purged with the product of the gas burner and preheated by the last two pots that have left the furnace. It is then transferred from the recuperator to the furnace, in which it is heated for the required period. During heating the artificial atmosphere is maintained and atmospheric oxygen thereby excluded by circulating gas continuously through the pot. When the anneal is complete the whole pot with its contents is lifted out of the furnace and returned to the recuperating trench, where the first stage of cooling and, simultaneously, preheating of fresh pots takes place, the gas supply being maintained to compensate for the contraction inside the pot Finally, the pot is removed from the recuperation trench and transferred to a cooling station; when cool enough to touch, the charge is lifted out of the pot on its base plate, leaving the cover and its suspension rods free for attachment to another loaded base plate.

The whole heating operation is governed by automatic temperature control gear, which embodies a direct deflectional temperature controller, pilot lamps, push button control switch, fuses, and Cambridge indicating pyrometer for measuring the temperature inside the charge. The main switchgear, consisting of triple pole isolating switch, contactors, fuses, &c., is housed in a separate cubicle.

The G.E.C. coal gas burner enables a suitable artificial atmosphere to be produced from partially burnt town's coal gas that is cheap enough to be blown to waste, and refinements for drying and removing traces of sulphur are not required, since the furnace is designed so that the gas does not come into contact with the heating elements and the effect of a trace of sulphur in mild steel is negligible.

New Film Recorder

A CINEMA film outfit developed by Electrical Research Products for recording sound directly on 16 mm. stock is announced by the Western Electric Co., Ltd., as of interest to producers of motion pictures for specialised non-theatrical purposes, such as educational, industrial and advertising uses. Indirect methods of optical reduction from sound tracks originally recorded on standard film involve considerable loss of quality. With the new machine direct recordings may be made independently, and by electrically interlocking with a 35 mm. recorder both sizes of negative may be made simultaneously. It can also be used to re-record from existing 35 mm. product, thus permitting the introduction of such changes in frequency characteristics as experience has shown to be desirable for reproduction on 16 mm. projectors.

Correspondence

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Insulating Small Motors

IN connection with the manufacture of fractional horse-power motors, there appears to be some difference of opinion with regard to insulation of field coils wound with enamelled wire. Some makers impregnate these with insulating varnish, while others simply bind them with a layer of varnished tape followed by a second layer of cotton tape which is not treated in any way, although the conditions of working are apparently similar. I would be pleased to have your readers' views as to which method is more satisfactory in practice and the merits of each. F. W. ROBERTS.

Birmingham, *August 24th.*

Mains in Highways

The article by "Barrister-at-Law" entitled "Mains and Cables in Highways" (ELECTRICAL REVIEW, August 12th, p. 221), brings out many of the disabilities under which an undertaking operates when laying mains in public streets. He has succinctly dealt with the contentious problem of altering street surfaces by highway authorities, and the "heart-burning" which may occur when the question of payment arises, for altering mains.

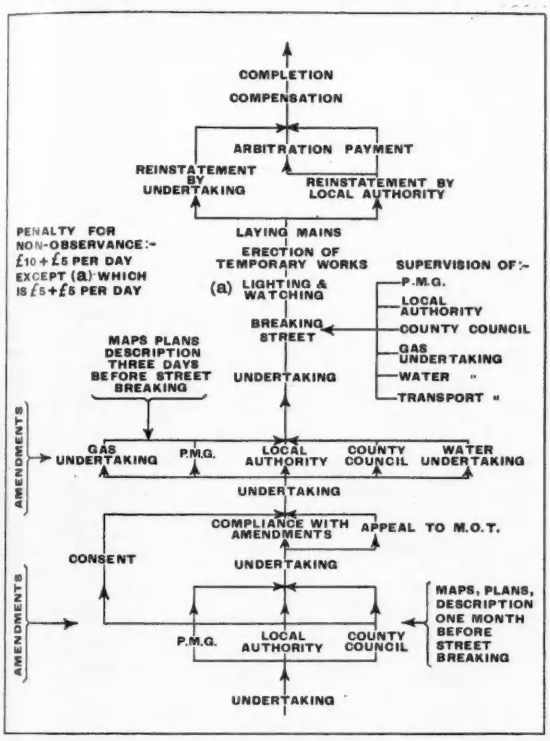


Fig. 1.—Progression of notices, amendments, &c., for breaking public street repairable by the local authority

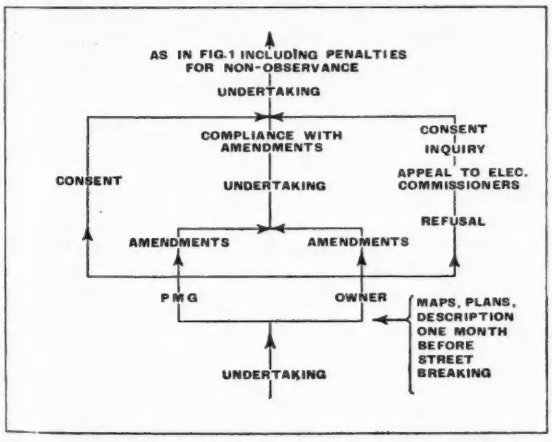


Fig. 2.—Progression of notices, amendments, &c., for breaking private street not repairable by the local authority

NOTE: Maps, plans, descriptions, advertisement and affidavit must be sent to the Electricity Commissioners. Permission must also be obtained from them if street is not already scheduled, even though owners' consent has been received.

Thinking over this problem makes one want to know the means laid down by the Legislature for normal protection of these authorities. The inquirer is confronted with clauses from the Electricity (Supply) Acts, together with related provisions in the Gasworks (Clauses), Telegraph, Highway, Public Health, and Local Government Acts. In attempting to obtain a clear picture of an undertaking's responsibilities a diagram (fig. 1) was constructed, giving the progression of the legal requirements.

The method is rather novel, but does serve a useful purpose. Experience with distribution problems familiarises an engineer with the dissimilarities of "public" and "private" streets. Hence it was necessary to make a second diagram (fig. 2) for the purpose of bringing out the essential differences in procedure. G. V. HARRAP.

Hull, *August 20th.*

Road Rollers

A little way down the road a steam roller engaged on road making work is causing an almost unbelievable amount of nuisance. Our offices and showrooms are filled with pungent and irritating fumes, and the visibility along the road is reduced to something less than 200 yards by a yellowish pall of smoke.

Cannot some of our manufacturers develop an efficient electric road roller? It seems to me that the battery weight which in other forms of locomotive is disadvantageous, would be an added advantage for this particular purpose.

It is to be further hoped that following the introduction of a fumeless road roller the Minister of Transport will speedily make regulations prohibiting such flagrant acts of hostility against householders who are often prosecuted for lesser offences.

The opinions of your readers with experience of commercial electric vehicles would be welcomed. H. C. BUSBRIDGE,

Swinton, *August 24th.* *Borough Electrical Engineer.*

Driving Earth Electrodes

In connection with the energy figures given by Mr. H. G. Taylor for driving electrodes several feet into various types of soil or earth, it would be of some interest to know if any test were made when an electrode actually conducted an earth current while being driven.

Some of your readers may recollect a report made some years ago when electrically driven winches were employed to draw a plough. A leakage to the ploughshare had a lubricating effect due, it was thought, to electrolysis and formation of a gas film between the plough share and the soil through which it was drawn. I recollect a statement being made that the tractive pull required was considerably lessened when the ploughshare was negative to the soil. Possibly the effect with a driven electrode would be similar, but the "lubricating" effect of a gas film would decrease the efficiency of an earth electrode, which would be isolated from the soil because of the high resistance gas film.

Electrolysis will occur to some extent even with small a.c. capacity currents, especially if the electrode surface becomes slightly corroded and can act as a rectifier. An electrode driven several feet into clay, for example, affords no means for gas to escape because of the seal between the clay and the electrode surface. In the case of a plate electrode near the soil surface, a porous filling and a much greater top surface of metal does afford means for gases to escape and there is, therefore, much less risk from an insulating gas film.

A long electrode might be suitable for momentary currents able to effect tripping; but there is always the risk that persisting leakage currents of less than tripping values would form gases by electrolysis and thereby give a variable resistance at the electrode surface. Unless such gases can be dispersed, any apparatus depending on the electrode will operate erratically, because the rate of gas production and its accumulation will directly influence the ohmic resistance in the circuit of the protective apparatus. Apparently earth electrodes involve a ventilating factor as is the case with all other electrolytic circuits.

Liverpool, *August 26th.* A. G. BULLEN.

In his interesting article on "Driving Earth Electrodes" in your issue of August 26th, Mr. Taylor omits one most important matter, the question of current loading of the electrodes he advocates. In my view, it is not sufficient to produce an electrode with a low initial resistance, or with easy driving properties; it must be capable of carrying heavy overload cur-

rent possibly for some period of time without consequent or serious rise in resistance. Without this characteristic, the electrode is useless, however low its resistance or high its conductance.

In the instance given of electrode resistance at 8 ft. depth, of 1,700 ohms and at 16 ft. depth of only 47 ohms, it is clear that this ¾-in. copper rod is tapping a very few feet of low-resistance strata, and it is doubtful if its resistance would remain at this low figure with a substantial current flowing over it. An overload current may remain below the critical value for a long period, and if the electrode resistance rises in consequence, it is clear that no chance of isolation by means of the overload protective devices exists.

I quite agree with Mr. Taylor's view that the depth of the electrode is a matter of vital importance, if only for the fact that it is less liable to seasonal variations. I would, however, point out that the opposite view, which he describes as an illusion, has been largely fostered in this country by reason of E.R.A. Report F/T50, "The Resistance of Earth Electrodes," published in 1932, for which Mr. Taylor was responsible, in conjunction with Mr. P. D. Morgan, and in which figures and curves were advanced in support of the "illusion."

With regard to my article on "Leakage Potentials" which was published in the ELECTRICAL REVIEW of August 19th, I thank Mr. Taylor for drawing attention to the fact that answers have been made to my criticisms in the Institution *Journal*. It seems to me, however, that the only person who appears completely satisfied with the replies as recorded is Mr. Taylor, who was responsible for them; hence the wider publicity given to the points raised. T. C. GILBERT.

Folkestone, *August 27th*.

Lift Installations

With regard to the article on this subject by "Logicus," published in the current number of your journal, there are some points upon which I should welcome some enlightenment and I set them out in the order in which they are printed:—

(1) Your contributor states that the a.c. supply to and the d.c. supply from a rectifier may not be run in the same tube (conduit?). The only regulation I can find on the subject is I.E.E. 408 (N) which permits it.

(2) It is stated that electric tubing must be run at least 3 inches away from gas or water pipes. Whose ruling is this and why cannot insulating barriers be inserted between the conduits and pipes when they are run closer?

(3) When referring to the light in the cage, reference is again made to the necessity of keeping apart a.c. and d.c. wiring. I am, of course, aware that signal and control circuits must be kept away from lighting and power supplies trailing cables.

(4) The author says that "c.t.s. flexible should be supplied where weather conditions are liable to affect a taped and braided cable." I.E.E. Regulation 407 (A) prohibits a tough rubber sheathed cable in situations where it will be subjected to direct sunlight unless suitable protection is provided. Is it correct to assume that the author implies this protection?

I realise that some of these points are probably covered by L.C.C. and Factory Regulations, but surely they cannot be applied, for example, to lifts in blocks of flats in the provinces.

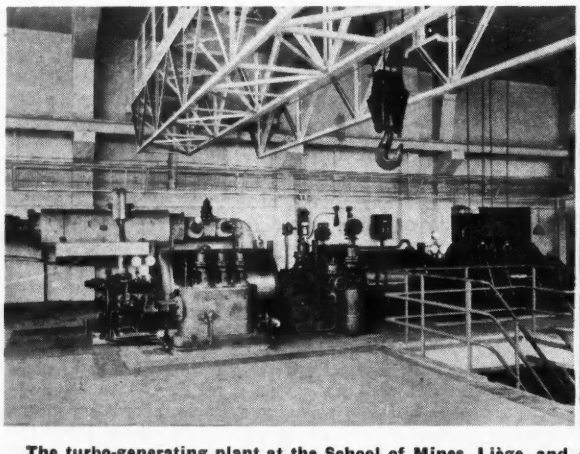
London, W.5, *August 27th*. C. BAKER.

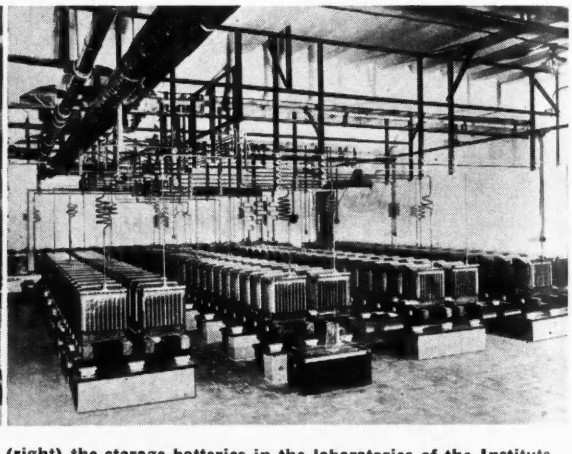
Interesting Belgian Installation

Generating plant and bled-steam heating

AN unusual installation was recently completed for the faculty of applied sciences of the Liège School of Mines, Belgium, inaugurated on the occasion of the centenary of the school. The buildings comprise the Institutes of Chemistry and Metallurgy, Civil Engineering and of Mechanics.

A service building houses the heating and generating plant for the whole group. This is based on the principle that its main purpose is to heat the buildings, electricity production being accessory, but nevertheless the generating plant is capable of producing much more electricity than required, the excess being sold.





The turbo-generating plant at the School of Mines, Liège, and (right) the storage batteries in the laboratories of the Institute of Chemistry and Metallurgy section

A pressure of 497 lb. and a temperature of 842 deg. F. were chosen. The turbo-generator installation to which this steam is fed serves merely to drop the temperature and pressure to values suitable for use in the heating installations of the buildings. In the process, however, about 1,250 kVA is produced.

The turbine is a reaction type, divided into h.p. and l.p. sections to permit as much steam to be drawn off as may be necessary for the heating of the buildings without seriously affecting the power production. Directly coupled to the turbine is an alternator rated at 1,250 kW, 50 cycles, three-phase at 6,300 V, operating at 3,000 r.p.m., with an exciter on the same shaft.

The output goes to bus-bars from which a three-conductor cable feeds into the supply network, two panels are occupied by the two ends of the loop which feeds the three buildings, two further panels control step-down transformers for the auxiliary services, while two positions are in reserve for future extensions by the construction of a second feeder loop to the buildings. The high- and low-voltage switchboards are both placed in the generator room, the latter controlling the various lighting and power circuits of the power plant, as well as the 360Ah storage battery used for distant control apparatus.

The chemistry and metallurgy Institute has an extensive installation. Lighting takes 200 kVA, while a considerable amount of power is required for electric furnaces, mechanical testing equipment, conductivity tests of metals under various conditions, and arc welders. Apart from these uses, fed either directly with a.c. or in the case of some of the furnaces through rotary convertors, electrolysis tests are carried on with the aid of three 80-V storage battery groups.

I.E.E. Notes

A GOLF competition organised by the North Midland Centre of the Institution of Electrical Engineers and held on June 30th on the links of the Headingley Golf Club, Adel, Leeds, has enabled a contribution of over £40 to be made to the Institution's Benevolent Fund. The annual electrical engineers' dance at Harrogate will be held this year at the Grand Hotel on November 18th.

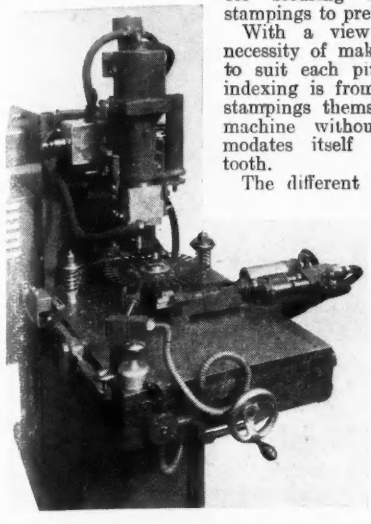
The annual summer visit of the North-Western Students' Section of the Institution of Electrical Engineers will take place on September 17th, and will be to the factory of British Crepe, Ltd., Middlewich.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Automatic Spot Welding

AN automatic spot-welding machine recently introduced by SCIAKY ELECTRIC WELDING MACHINES, LTD., Slough, is intended primarily for the building up of clamping rings for securing rotor and stator stampings to prevent hum.



The Sciaky automatic spot-welding machine loaded with a set of rotor stampings approx. 14 in. in diameter

With a view to avoiding the necessity of making a master ring to suit each pitch of tooth, the indexing is from the teeth of the stampings themselves, so that the machine without change accommodates itself to any pitch of tooth.

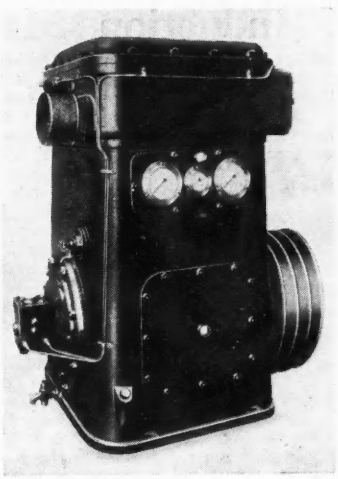
The different welding conditions required by the three rows of spots have been met by the Sciaky welding control which measures a function of ampere-seconds at the weld and gives any three pre-determined settings which are, in turn, brought into operation by cams when the machine moves from one row of spots to the next.

The welder will provide up to three rows of spot welds, one row at the root of the tooth, another at approximately the centre of the tooth, and a further row on the body of the stamping. Having set the machine to give the correct spacing between the rows of welds, the stampings are loaded on their jig and the machine started by a tumbler switch mounted on the front of the table. One row of welds having been completed, the machine automatically stops and is restarted by striking first the knob on the extreme left of the table—this moves the table to the next welding position—and then striking the second knob which restarts the machine for welding the second row. The same procedure follows for the third row of spots, whereupon the job is complete.

With an unskilled operator it is claimed that one rotor or stator of the size shown can be completed in approximately two minutes.

A Compact Air Compressor

The new "Monobloc" vertical two-stage compressor type "M," of J. BROWETT LINDLEY (1931), LTD., Letchworth, Herts, has been designed to meet the demand for smaller outputs than those provided by the standard range. Like the larger compressors, the unit is of the cross-head type, in which the oil supply to the two cylinders can be controlled within fine limits, with a view to ensuring clean outlet air, which is important for such applications as paint spraying, enamelling and food manufacture.



The "Monobloc" type "M" air compressor

Delivery pressure is from 60 to 150 lb. per sq. in. Every working part is contained within the frame of the machine, including the flywheel. This renders the compressor particularly suitable for use in dirty or dusty atmospheres. All bearing surfaces are large and the crankshaft flywheel forging is mounted on large taper rollers.

A simple gear pump is mounted at the end of the crankshaft for supplying oil under pressure to all working parts. A separate mechanical lubricator for the cylinders is mounted externally. By this means the oil supply can be carefully controlled. An "Auto-Klean" oil strainer, which can be cleaned by a turn of the handle whilst running, is provided in order to prevent grit reaching the bearings.

Although compact in design, the parts are readily accessible. For example, the valves, mild-steel pistons, piston rods, connecting rods and inlet control governor are all accessible from the top by removal of the covers only. The motion work can be reached by removal of large doors at front and rear. A filter, which safeguards the air supply and prevents excessive wear, is also easily removable for cleaning.

The drive can be by vee-rope, chain, belt or direct coupling. The valves are of the automatic plate type with small lift and giving negligible wear. The valve chambers and covers are watercooled.

A Balancing Table Lamp

A novel introduction by the PERRY BEVANS CO., LTD., Priory Road, Aston, Birmingham, 6, is a balancing table lamp. This has a weighted base in the form of a half-sphere, the flat side uppermost, so that when the lamp is knocked it will go over, almost horizontally, and then return to the vertical.

The balancing table lamp

A Process Timer

SYNCHRO TIME SYSTEMS, LTD., the industrial branch of Smith's English Clocks, Ltd., Cricklewood Works, London, N.W.2, have brought out a new process timer.

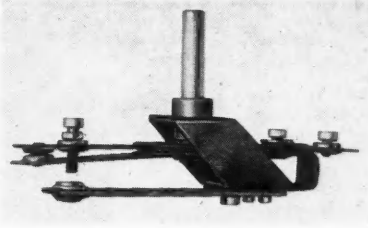
The purpose of this machine is to give visual and audible signals of the expiration of prearranged periods of time and may be set for any period up to 59 minutes. The mechanism consists of a "Sectric" self-starting movement fitted with a rotating arm which trips a mercury tube switch so that a low- or mains-voltage supply may be used to operate a lamp and bells or syrens.

A knob at the base of the case is pressed to stop the signals and another knob at the right hand side to reset the pointer to the desired number of minutes. Another pointer, enamelled red, is set simultaneously with the main pointer and remains stationary while the main pointer travels back to zero. A faceted red lens is fitted in front of the lamp to increase the angle of visibility.

The mechanism is fitted in a substantial cast-iron case 9¼ in. by 5⅝ in. by 4½ in., made steam and waterproof and fitted with packed wiring glands.

An Iron Thermostat

A thermostat for electric irons is now being made by the BRITISH THERMOSTAT CO., LTD., Windmill Rd., Sunbury, Middlesex, in skeleton form only. It is also suitable for controlling the temperature of small platens, as in vulcanisers.



The "Teddington" type DF iron thermostat

The temperature-sensitive element is a bi-metal strip operating an independent switch with silver contacts rated to control loads of up to 1,000 W on a.c. voltages of from 110 to 250 V.

For effective operation the thermostat must respond to changes of sole-plate temperature only. This is ensured in the type DF thermostat by arranging the bi-metal strip in intimate contact with a machined face on the sole-plate.

The thickness of the sole-plate should be reduced in the neighbourhood of the thermostat to not more than ¼ in., to render the thermostat sensitive to changing conditions.

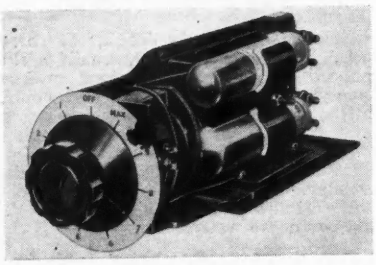
The bi-metal strip does not itself carry current and is not exposed to direct radiation from the heating element.

Regulation is obtained by raising and lowering the upper spring-mounted switch contact, for which purpose an adjusting cam and spindle are provided. Rotation of the spindle to its fullest extent gives a definite off position, and the adjustable temperature range is from 220 deg. to 500 deg. C.

The DF thermostat is available in two forms, with the adjusting spindle arranged vertically for irons with the control knob placed on the top of the body of the iron; or with the spindle arranged horizontally for positions where the knob is situated at the back of the iron.

Simmering Control of Novel Design

An unusual form of hot-plate simmering control giving an almost infinite variation in heat has just been produced by SUN-VIC CONTROLS, LTD., Stanhope House, Kean Street, Aldwych, W.C.2.



The Sun-Vic "Simmerstat"

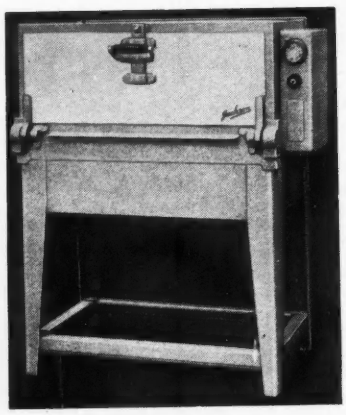
It operates by opening and closing the circuit at definite time intervals; thus the longer the "off" time the smaller the input to the hot-plate and the lower the temperature.

No tappings on the element are required, neither is a multiple heat switch necessary as the "Simmerstat," as this device is called, will control any hot-plate rated at up to 2 kW 230 V, a.c. or d.c.

The apparatus is designed for mounting in a position where the three-heat switch is normally fitted to the cooker; "Sun-Vic" vacuum switches, which are totally enclosed in evacuated glass tubes, are employed, and as there is no temperature-sensitive element they can be fitted in any convenient position.

Thermostatically Controlled Pastry Oven

The JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, London, S.W.1, is making a new pastry oven so controlled that a continuous output of cooked food may be maintained over long periods with the minimum attention.



The thermostatically controlled Jackson pastry oven

The oven is supplied with one, two or three decks, mounted on suitable floor stands and each compartment measures internally 29 in. wide by 21 in. deep by 9 in. high, the heating elements being in the top and bottom of each oven.

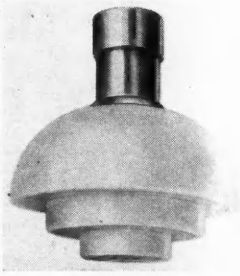
A special thermometer is fitted the dial of which is mounted in a separate box on the right-hand side of the oven, and incorporates a pilot light for easy visibility.

The oven is controlled by a thermostat which ensures the correct temperatures being maintained for the different classes of cooking, and the simplicity of control is an added advantage.

Although large outputs may be obtained with these ovens the floor space required is only 3 ft. 4¼ in. (width) by 2 ft. 4½ in.

Utility Lighting Fittings

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, has recently extended its utility range of lighting fittings by the addition of two new types. These are of opal glassware, 12 to 16 in. in diameter, and stepped down in three tiers, the base of each tier being etched away, leaving a satin finish which enables the lighting to be directed downwards on to the goods displayed on a counter or in a shop window. They also provide efficient illumination for all general lighting purposes and are made in ceiling and pendant form. The patented type of canopy which is fitted permits both hands to be left free when removing the globe.



The G.E.C. three-tier opal lighting fitting

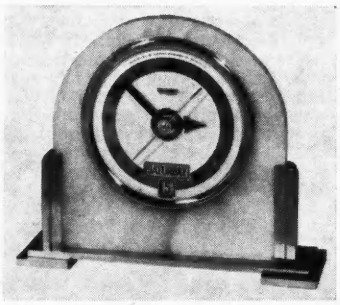
An All-insulated Grip-on Handlamp

With regard to the note under the above heading in our issue of August 12th the BRITISH CENTRAL ELECTRICAL CO., LTD., 6 and 8, Rosebery Avenue, London, E.C.1, asks us to point out that it is the "Super-Gripper" pattern that has been redesigned and that the standard type is still available.

Electric Clocks

A new and extensive range of "Hammond" clocks is being sold by ELECTRICAL COMMODITIES, LTD., Sparton Works, Beresford Avenue, Wembley.

Several datal clocks are included, while alarm clocks are available at from as little as a guinea. A typical model is the "Apex,"

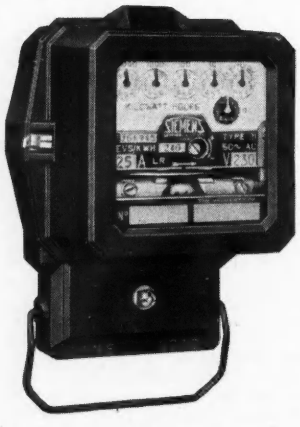


The "Regal" datal clock

a desk and mantel clock with a veneered walnut case, silvered 4½-in. hand-fret dial and hands, and a chromium bezel. An alarm movement is incorporated. The "Regal" has an onyx surround in white, green or black on a gilt base, with gilt ornaments. Black numerals and black hands tone with a 3½-in. silvered dial.

A New Single-phase Induction Meter

DESIGNED with a view to meeting the requirements of the Electricity Commissioners in the most practicable manner, the new Type 21 long-range induction watt-hour meter which SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., of 38-39, Upper Thames Street, E.C.4, is introducing for use on single-phase 200 to 250-V 50-cycle circuits embodies several notable features. Outstanding among these is the almost fool-proof manner in which its components can be replaced after dismantling, which makes for easy recalibration after overhaul. Thus the counting mechanism is sprung into accurate mesh with the pinion, which is milled out of the rotor spindle.



The new Type 21 long-range induction watt-hour meter

To this spindle the aluminium-disc rotor is fixed by means of a cast-on hub, a central hole in which contains the sprung pivot. A correctly oriented jewel forms the vertically-adjustable lower rotor bearing. The guide pin of the upper bearing is of hardened steel running in an easily renewed polished bearing.

For the two-brake magnets an alloy of nickel, chromium, cobalt and iron is used having a coercive force at least twice that of cobalt magnets and allowing a gap (0.15 in.) about 20 per cent. greater than that hitherto used for meter magnets. The main frame supporting the two brake magnets, rotor, bearings and counter bracket is a pressure die-casting made of aluminium silicon with a view to securing freedom from inter-molecular and surface corrosion. A mild-steel mounting plate is dowelled to receive the main frame and the shunt and series elements in order to ensure accuracy in replacement. The adoption of two-point horizontal suspension of the mounting plate, combined with two-point vertical suspension of the base, prevents the meter element being affected by distortions of the meter board. Full-load adjustment is of the magnetic shunt type, involving no motion of the magnets.

Easy entry is provided for cables to the terminal block which is integral with the base and is fitted with moulded-in brass terminals with large-headed screws. The customary shorting strap has been eliminated, the two middle terminals being made in one piece, and the potential circuit is isolated for testing merely by backing off one screw.

The base and cover are insulated mouldings of attractive appearance. A special cover can be supplied to enable the cover seal to be concealed at the back of the meter, and an extended terminal cover to shroud the connecting cables.

The meter complies with B.S.S. No. 37—1937 and will cope with 100 per cent. overload continuously. In addition to the five standard sizes of 2½, 5, 10, 25 and 50 A with r.p.m. per kWH, inversely proportional to the ratings, of from 2,400 to 120 r.p.m., models of 20 and 40 A are available. At rated current and 230 V, the rotor-torque is 4.6 grm-cm, its speed 23 r.p.m., and its weight complete 20 grm. Losses are stated to be 1.1 W for the shunt coils at 230 V and 0.3 VA for the series coils of a 10-A meter at full load, while 10 per cent. excess voltage does not produce creeping. Starting current is given as 0.5 per cent. of full-load, and accuracy between 5 and 200 per cent. of rated current as ± 2 per cent. at unity p.f. The instrument weighs 4 lb. 9 oz. net.

Lighting Publicity Plans

Further details of manufacturers' programmes for the coming season

LAST week we published an outline of the programme of some of the lamp manufacturers for the 1938-39 lighting season. Since then various other details have come to hand, which, coupled with the announcement by E.L.M.A. of these sales aids are detailed and illustrated in the September issue of *Selling Light*.

Further examples of manufacturers' lighting publicity. Most of them are self-explanatory; the bottom centre picture shows the front pages of two of the Benjamin planned lighting pamphlets

a reduction in prices, should further assist in encouraging the sales of lamps and lighting equipment.

A nation-wide appeal by means of a film entitled "Worthy Representation" is the most interesting feature of the programme of PHILIPS LAMPS, LTD., this being, we believe, the first time that the cinema has been enlisted as an important factor in a lamp sales campaign. The story told by the film in a subtle entertaining way is that the sun oversleeps itself one morning and awakens to find its place taken by a Philips lamp. The film, which is to be released next month, is in full colour and synchronised to music, and at its end a direct "tie-up" with the company's poster campaign is effected by a poster being flashed on to the screen.

For the poster campaign an extremely attractive 16-sheet poster in nine colours has been adopted, continuing the "baby appeal" with the theme: "Keep your eyes young! Use Philips lamps and see." To link up with this poster there is a new window display centre-piece, which strikes a warm and colourful note with its tones of magenta, blue and yellow. Supporting these major items is a most comprehensive assortment of window and counter display materials, showcards, catalogues and leaflets, a special range of materials being available in connection with automobile lamps. All

The Mazda window display

In connection with industrial lighting publicity the company has produced a 36-page publication entitled "The Philora Plan for Industrial Lighting," describing the advantages of sodium and mercury discharge lighting. In view of the requirements of the new Factory Act this should be of great interest to all factory executives, lighting engineers, and others concerned.

Attractive and informative catalogues and folders issued by POPE'S ELECTRIC LAMP CO., LTD., embrace "Elasta" lamps for general and special lighting services and also for automobile lighting. Display literature consists of attractive showcards, cut-outs, counter literature holders, and other helpful features. Stressing the value of its despatch and delivery services, the company has waxed musical in its publicity materials, and claims that all orders placed with it are executed at "hot rhythm" speed and that the "Elasta" top note is to promote harmony in trading to the fullest possible extent.

In addition to an extensive campaign in the national, provincial and weekly Press, the Atlas publicity arrangements comprise the distribution of posters, window displays, and an extensive selection of show material of original character. "Bob Atlas" appears once again, in a striking 16-sheet poster in eight colours, which will form a big feature of the company's

outdoor publicity. He is seen energetically striding to catch the attention of the passer-by.

Among the show materials there will be a number of new items printed in full colour, including window bills, showcards, and an illuminated flicker sign. The last-mentioned device, which is carried out in eight colours, is suitable for either window or counter use, and it depicts a man reading alternately under bad lighting and then under Atlas illumination. An attractive brochure giving full particulars of the Atlas publicity is obtainable from THORN ELECTRICAL INDUSTRIES, LTD.

With a view to promoting co-operation between sections of the electrical industry, BENJAMIN ELECTRIC, LTD., has prepared a series of leaflets which are addressed to various trades and which deal with their particular lighting requirements. These leaflets, the cover designs of which are most original and attractive, will be posted during the early autumn to a large number of users throughout the country. Special leaflets have also been designed for use exclusively by contractors and wholesalers, and next week a 48-page booklet is to be posted to members of the electrical industry throughout the country giving useful information to help them to deal with customers' inquiries. This "Benjamin Recipe Book" will contain illustrations of typical installations in various trades, together with descriptive notes. Press advertising will appear in nearly a hundred trade journals.

In our last issue we referred to the publicity material of the EDISON SWAN ELECTRIC CO., LTD.; we illustrate this week an example—the window display piece which the company has produced. We also made reference to the B.T.H. Co.'s efforts. Among the sales aids prepared by this company is a window display (illustrated herewith). The background of the display is of dark blue—matching the deeper blue of the display-piece in the centre, whilst the floor and flare behind are in lemon-yellow edged with dark blue tubes. The Mazda display-piece itself is in pleasing harmony with this colour scheme, with the lamp, the United Kingdom and essential wording printed upon transparent paper so that they may be brilliantly illuminated by a single 60-W lamp inserted in an opening provided at the back of the display.

Alloys for Electrical Construction

By L. B. Hunt, A.R.C.S., M.Sc.

DESIGNERS of switchgear and other electrical equipment have benefited in recent years by marked improvements made in the properties of structural electrical sheet steel, non-magnetic cast-iron, plastics and other insulating materials. Comparatively little effort has been made, however, to improve the materials required for the current-carrying parts of electrical equipment. Where the maximum electrical conductivity is essential in such parts copper must still be relied upon, as it has been since the beginnings of electrical engineering, while for those parts subjected also to mechanical stresses or wear, when the softness and limited strength of copper make it undesirable, brass or bronze is normally used.

In this way the designer obtains marked strength and hardness, but has to make a severe sacrifice in electrical conductivity. Expressed as a percentage of the conductivity of standard annealed copper, that of the average yellow brass is only 26, and that of phosphor bronze or aluminium bronze only approximately 18. Heavy electrical losses, sometimes accompanied by undue heating, may thus be occasioned, or recourse may be had to increasing the section of the components in order to obtain sufficient current carrying capacity. In the present state of electrical design any such increase in the size of either moving or stationary components is highly undesirable, and in fact the maximum economy of section is usually necessary. At the same time the purely mechanical stresses to be met with in switchgear and other equipment have increased markedly with the increasing currents to be handled, while in certain cases heavier currents have to be carried by any given section.

Problems of Hardening

The difficulties that have previously restricted the development of copper alloys of high conductivity are concerned with the metallurgical structure of the available material. The usual method of imparting hardness and strength to alloys of copper by the addition of tin, zinc, nickel or aluminium breaks down when it is desired to retain even moderate electrical conductivity. The addition of quite small percentages of such metals results in the formation of metallic solid solutions, which are characterised by greatly increased electrical resistivity. The key to the problem of combining greater strength with better conductivity has been found, however, by adopting an entirely different method of increasing hardness and strength. This method, based upon the formation of finely dispersed sub-microscopic particles of certain rarer elements as a result of a special heat treatment process, causes only a slight reduction in electrical conductivity but a marked increase in tensile strength, hardness, wear resistance and other mechanical properties. The development of this technique in its application to the commercial production of stronger copper alloys is due to P. R. Mallory & Co., Inc., of Indianapolis, U.S.A., and their British associates, Mallory Metallurgical Products, Ltd., of Waddon, Croydon.

A range of copper alloys of varying properties has been made available to the electrical engineering industry in both wrought and cast forms. By the selection of various complex intermetallic compounds as the hardening constituents of these alloys strength properties have been obtained ranging from 30 up to 80 tons per sq. in., the electrical conductivity varying inversely from 85 per cent. that of copper to approximately 30 per cent. The member of this range having the highest electrical conductivity, known as Mallory 3, has the properties set out in the table, in which typical properties of hard drawn copper and high conductivity copper castings have been included for reference.

These data indicate that such an alloy has considerable potentialities as a structural material in electrical engineering practice. The possibility of obtaining castings, if necessary of complicated section, with an electrical conductivity of 80 per cent. that of copper yet with the strength and hardness of steel must open up a number of lines of advance in electrical design and construction. Castings in this material have a high resistance to fatigue; for example, the high impact strength is retained to a great extent at elevated temperatures, not falling below 50 ft.-lb. even at 40 deg. C.

Strength and Wear Resistance

In addition to the hardness and strength obtained by the process referred to, further hardening may be imparted to this type of alloy by the usual methods of cold working. In the wrought form, therefore, whether as forgings or rod stock, the properties of Mallory 3 are superior to those obtainable with sand castings, yet an electrical conductivity equal to that of the average copper casting can be retained. Thus in either cast or wrought form considerable advantage over copper is obtained in such applications as circuit breaker parts or other components where mechanical stresses have to be withstood in addition to high current carrying capacity.

The wear resistance of this alloy and of the other members of the range is also greatly superior to that of copper, particularly under heavy loads, and it is this factor, together with high thermal and electrical conductivity and retention of strength up to temperatures as high as 500 deg. C., which has led to their extensive use for resistance welding dies and electrodes. When wear is associated with centrifugal stresses, as in large slip rings, these alloys have again proved useful, while for current carrying springs the greater strength members of the series are employed. Further prospective applications include terminal blocks and sockets, bus-bar clamps and bolts. In the last case an important factor is the coefficient of expansion, which in the Mallory alloys is virtually the same as that of copper. For this reason, and also owing to the high thermal conductivity, uneven stress distribution and distortion are avoided. The high softening temperature is also of importance in allowing soldering operations to be carried out at temperatures up to 500 deg. C. without affecting the physical properties of the material.

	Mallory 3 wrought.	Mallory 3 cast.	Hard-drawn copper.	H.C. copper castings.
Maximum stress tons/sq. in. ...	35	22	22	12
Proportional limit tons/sq. in. ...	22	12	10	1
Elongation, per cent.	15	25	15	30
Reduction of area, per cent. ...	50	60	60	40
Brinell hardness	150	120	90	40
Rockwell B hardness	80	70	48	—
Izod value ft.-lb.	65	75	50	40
Fatigue strength tons/sq. in. ...	+9	±10	±7	±4
Electrical conductivity, per cent....	85	80	97	85

Other members of this range of alloys possess differing combinations of high strength and conductivity, such as a tensile strength of 40 tons per sq. in. with 60 per cent. electrical conductivity, or 50 tons per sq. in. with 50 per cent. conductivity. In this way designers have at their disposal a range of specialised products from which to select the most suitable material when they are faced with a particular combination of mechanical and electrical requirements.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Lamp Prices Reduced

THE Electric Lamp Manufacturers' Association announces substantial reductions in the prices of a number of the lamps made by its members. The reductions apply only to standard-voltage types (100-130 and 200-260) and are set out below :—

Watts	Pearl		Clear		Opal	
	Old	New	Old	New	Old	New
15	1/9	1/6	1/9	1/8	—	—
25	1/7	1/6	1/9	1/8	1/10	1/9
75	2/3	1/10	2/6	2/–	2/9	2/2
100	2/3	2/–	2/6	2/3	2/9	2/4
200	7/3	6/–	6/6	5/6	7/6	6/6
300	11/–	10/–	10/–	9/–	11/3	10/3
500	13/6	12/6	12/6	11/6	14/–	13/–
750	—	—	16/–	15/–	—	—

The brands affected are "Aurora," "Bell," "Cosmos," "Crompton," "Cryselco," "Ediswan," "Elasta," "Mazda," "Neron," "Osram," "Philips," "Siemens" and "Stella."

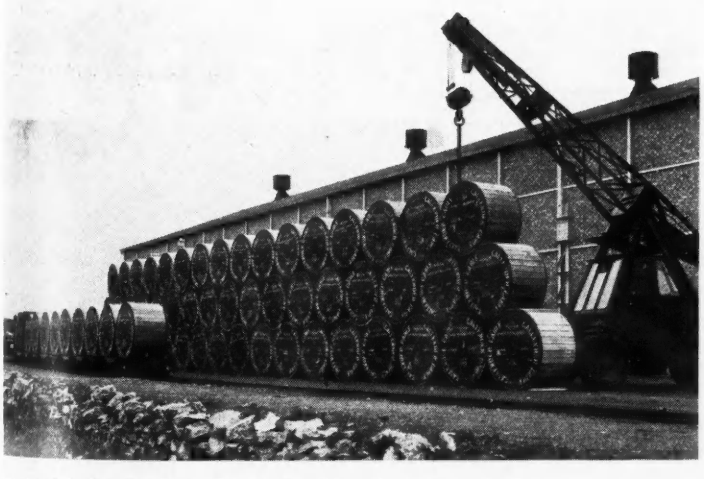
At the same time the Association has altered its discount arrangements. Instead of invoicing lamps at discounts varying according to the amount purchased by the individual customer throughout the year, E.L.M.A. members will now give the same rate of discount to all customers of any particular class. These customers will be entitled to quantity rebates varying with the amount of their purchases which will be paid periodically by the manufacturer on application through the Association. The aim is to enable members and dealers to conform with the principles of the Fair Trading Policy.

International Timber Conference

The Joint Committee on Materials and their Testing has received an invitation to send delegates to the fourth International Conference on Timber Utilisation to be held in Brussels from September 15th to 17th. Subjects to be dealt with include tests on the strength of timber in relation to building regulations, timber and plywood for aeroplanes, shipbuilding, &c., and modern possibilities of the utilisation of sawmill waste, and reports on the activities of the Department for Timber Utilisation. Further information from the Secretary, Comité International du Bois, 50, Rue Neuve, Brussels.

Irish Electrical Imports

Value of electrical goods imported into Eire in July last was about £70,000 less than that for the corresponding month of last year. In July, 1937, £323,264 worth of goods was imported, as compared with £252,256 worth last month. For the seven-month period, January-July this year, the value of imports was £1,833,144, as against £1,885,549 for the same period last year. Imports of electric lighting accessories, fittings and parts, however, rose in value from £7,256, in July, 1937, to £11,685 last month, and imports of electric wires and cables from £5,984 to £9,874; but the figures for telegraph and telephone apparatus fell from £8,312 to £2,466. There was a big drop in the number of fully manufactured radio sets imported, from 20,747 in July, 1937, to 6,866 last month. This is partly accounted for by the fact that radio sets are now being assembled in Eire.

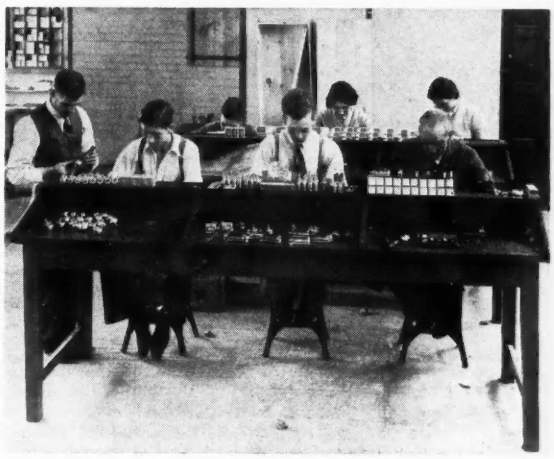


A Radio Valve Guide

Valves for every type of receiving set are described in the latest Osram Valve Guide. In addition to the fullest information as to working voltages, currents, power output, optimum load, &c., there is a wide range of circuits illustrating different classes of radio valves used in modern sets. Reductions listed are as much as 10s. Amateurs and experimenters as well as radio service engineers are invited to apply for copies of the guide from the Osram Valve Technical Dept., General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

Counting Devices

The growing use of precision counting mechanism by manufacturers of all kinds gives particular point to news of the activities of Veeder-Root, Ltd., in this country. Greatly increased production is reported at the company's recently opened factory in Purley Way, Croydon, and though the plant is at present used solely for the assembly of counters, we are informed by Mr. R. W. Bailey, the managing director, that the actual manufacture of certain components may later be undertaken. Counters of all types and sizes, both mechanically and magnetically operated, are being produced on the premises, of particular interest to the electrical industry being the resetting high-speed models capable of 2,000 r.p.m. and especially suitable for coil-winding, &c.



Assembling counting devices at the new Veeder-Root factory

Batti-Wallahs' Luncheon

The first monthly luncheon of the 1938-39 session of the Batti-Wallahs' Society will be held as usual at the Hotel Victoria on October 12th, when the principal guest will be Ald. E. Huntsman (a past-president of E.D.A.) who will deliver an address on the subject of "Electrical Development."

British Cable for South Africa

Johannesburg Municipality recently placed orders (through Wilson and Herd, Ltd., the South African engineers) for over eighty miles of cable manufactured by Callender's Cable and Construction Co., Ltd., including twenty-three miles of e.h.v. cable and sixty miles of paper-insulated, lead-sheathed, steel-taped armoured cable for 660 V. The e.h.v. consignment, with 0.25 sq. in. conductor, has arrived at Johannesburg. The accompanying picture shows sixty drums of the 660 V cable at Callender's Belvedere factory ready for dispatch. Each drum contains half a mile of three core 0.0225 sq. in. cable. This aggregation of drums represents, therefore, only 50 per cent. of the total mileage of this single order.

Callender cable ready for dispatch to Johannesburg, South Africa

Motors in a Laundry

Referring to the article on "Laundry Processes" in our last issue, Brook Motors, Ltd., inform us that over 90 per cent. of the motors installed in the laundry described are of their manufacture.

Marconi Summer School

With a view to giving wireless lecturers at universities and technical colleges first-hand information on the latest application of communication theory to wireless practice a summer school is to be held at the Marconi College, Chelmsford, from September 7th to 9th. Representatives of fifteen of the principal universities and technical colleges in England, Scotland

and Wales have signified their intention to be present. The curriculum includes lectures, followed by discussions, embracing some of the more important aspects of the practice of wireless communication, and visits to the Marconi Works, Chelmsford, and some of the Marconi research and development sections.

Radiolympia Stand Trophies

In connection with the Radio Exhibition at Olympia the *Wireless and Electrical Trader* presented two cups for the best stands at the Exhibition. The winners of the open trophy (irrespective of size of stand) were McMichael Radio, Ltd., the runners-up being Murphy Radio, Ltd. The limited trophy (for stands under 300 sq. ft.) was won by Cosmocord, Ltd., with A. F. Bulgin & Co., Ltd., as runners-up. Our picture shows Mr. L. McMichael receiving the open trophy from Mr. W. Buchanan-Taylor.

Mr. L. McMichael (left) receiving the "Wireless Trader" cup from Mr. Buchanan-Taylor. Seated are the Hon. Denis G. Berry (managing director of the Trader Publishing Co.) in the centre and Major L. H. Peter (chairman of the Radio Manufacturers' Association)

New Zealand's Demand for Electric Refrigerators

A warmer summer than usual in New Zealand has created greater interest in refrigeration than has ever existed before and has induced the Canadian Trade Commissioner in Auckland to report on the prospects for the sale of domestic refrigerators. Agents report good progress while the large number of inquiries received at the Commissioner's office provides further evidence of quickening interest. It is estimated that over half the total imports come from the United States, with Canada occupying second place and the United Kingdom third. The report states that the greatest deterrent to a larger volume of trade is the high retail price. Two popular makes at present on the market are priced as follows:—

Capacity.	Model A.	Model B.
3 cu. ft.	£59 10s.	—
4 cu. ft.	£62 10s.	£52 10s.
5 cu. ft.	£73 10s.	£57 10s.
6 cu. ft.	£85	£75

Although several well-known American manufacturers have supplied their agents with 3-cu. ft. models to retail at £49 10s., dealers do not push these lines but use them to create the interest of buyers in electric refrigerators generally. On the prices mentioned small discounts are allowed for cash payment, accessories such as defrosting bowls, vegetable crispers and meat trays being included. The Trade Commissioner explains how freight and distribution charges contribute to the high retail price of the article. A refrigerator that costs roughly $80 alongside ship in Canada retails for the equivalent of $210 in New Zealand, due to the high forwarding, handling and distributing costs. Ocean freight amounts to $16.50 on a 4-cu. ft. unit; duty at 30 per cent. *ad valorem* on the f.o.b. price plus 10 per cent., after allowance for the electric motor (which enters free) amounts to $19.20; and landing and handling charges to roughly $1.50, making a landed cost of approximately $117.50. In order to secure complete coverage it is usually necessary to deal through an agent who will appoint exclusive distributors in the various districts. This agent would require a commission of roughly $10 a machine, while the retailer would require about 40 per cent. on his retail price. There is no important refrigerator industry in New Zealand at present, though the high prices charged have induced a number of different organisations to investigate the prospects of local production or assembly. The cabinet and interior hardware could be made with existing facilities, but the consensus of opinion is that the unit would have to be imported. With local labour costs at present levels, it is questioned whether the proposition would be economical.

Prices of Materials

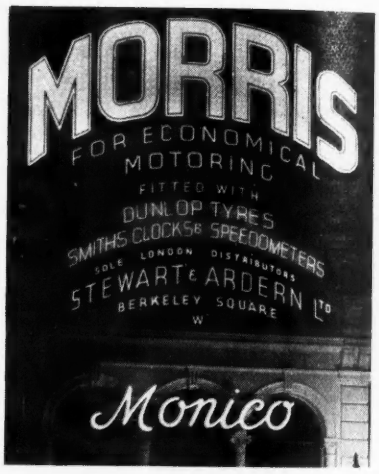
Henry Gardner & Co., Ltd., report, August 31st: Copper bars (best selected), sheet and rod, no change. English pig lead, £16 5s., 5s. decrease. Spelter, £13 2s. 6d., 2s. 6d. increase. English block tin, £192 5s., £1 15s. increase. Mercury, no change.

Frederick Smith & Co. report, August 31st: Electrolytic copper bars, £46 10s., 10s. increase. Ditto, ditto, wire rods, £51 5s., 10s. increase. Ditto, ditto, h.c. wire, 7⅞d., ¼d. increase. Silicum bronze wire, 8¾d., $\frac{1}{16}$d. increase.

Edward Till & Co., report, August 31st: India rubber, Para fine, no change.

A New Sign for Piccadilly Circus

Piccadilly Circus again displays one of the most notable achievements in sign artistry in the new "Morris" sign just completed over the Monico Restaurant. The word "Morris" is constructed of 7-ft. metal letters, with superimposed ice-blue coloured fluorescent tubing, and in addition is illuminated by 400 40-W Siemens opal lamps. These lamps are controlled by a dimming device (by Wm. Geipel, Ltd.) and the gradual illumination from zero to full brilliance and back to zero is timed with the complete flashing sequence of the sign and gives clear, sharp and definite publicity to the various components of the Morris car, and gives a readily readable message. The sign was designed, manufactured and erected by London Signs and Illuminations, Ltd. It has been built to conform with all existing regulations and consists of 260 ft. of blue fluorescent tube and 500 ft. of red neon tubing on metal letters.



A large new sign which has recently been erected in Piccadilly Circus

The new showrooms of the Sheffield Corporation Electricity Department, reference to which was made in our last issue: (left) the general showroom and (right) the lecture hall

The World's Metal Production

The customary statistics have just been issued by the Metall Gesellschaft of Frankfort-on-Main respecting the production and consumption throughout the world in 1937 of five of the chief non-ferrous metals. The accompanying table shows the works output and the total consumption in the previous record year of 1929 (1937 showing a new high record with one exception) as compared with 1936 and 1937 :—

PRODUCTION IN METRIC TONS.

	1929.	1936.	1937.
Lead	1,750,600	1,468,700	1,691,700
Copper	1,894,600	1,670,500	2,257,100
Zinc	1,457,400	1,477,000	1,635,200
Tin	195,400	186,400	205,400
Aluminium	282,100	365,700	490,600

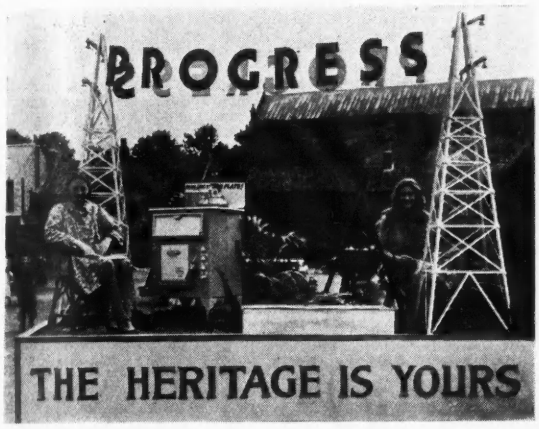
CONSUMPTION IN METRIC TONS.

Lead	1,703,000	1,579,200	1,722,000
Copper	1,760,900	1,784,400	2,062,000
Zinc	1,440,300	1,513,300	1,595,400
Tin	184,200	174,100	191,400
Aluminium	276,000	399,300	501,700

It is pointed out that a surprising development has taken place in the consumption of aluminium, which in 1900 amounted to 7,000 tons, advancing to 500,000 tons in 1937. Copper, too, has risen from 500,000 tons in 1900 to over 2,000,000 tons, the consumption of zinc has been trebled from 475,000 tons to 1.6 million tons, tin has risen from 80,000 tons to 190,000 tons and lead from 870,000 tons to 1.7 million tons.

A Prizewinning Tableau

At the recent Bridlington Carnival the Corporation Electricity Department arranged a display which was awarded a prize. The vehicle depicted ancient and modern methods of

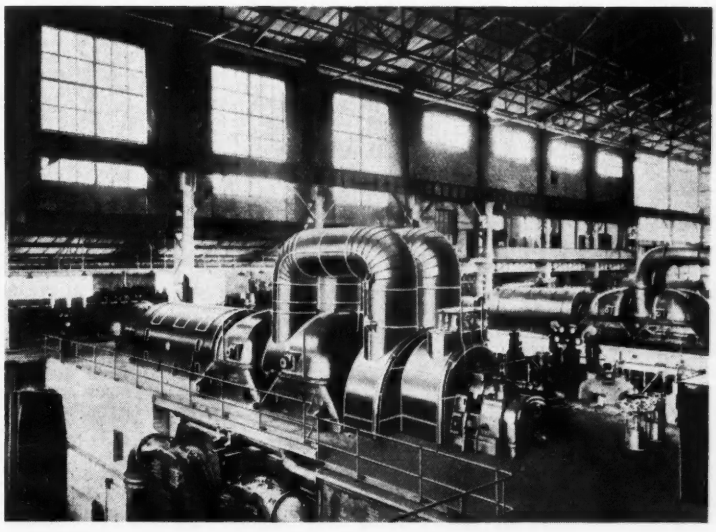


Bridlington Electricity Department's entry in the recent local carnival

cooking. One half of the lorry was laid out as a forest with a girl holding bow and arrows and dressed in skins, cooking her food over a log fire, while the modern girl merely had to sit by an electric cooker and read a book while her dinner was being cooked for her. A bust of Faraday on the cabin top and pylons indicated the progress since his pioneer work was carried out.

Turbo-Alternators for South Africa

The prosperity of the Rand gold-mining area is reflected in the rapid increase in the demand for electrical power from the Victoria Falls and Transvaal Power Co. To meet this demand a new power station has been erected on the Klip River about thirty miles south of Johannesburg, and is situated upon a coalfield. For this station sixteen turbo-alternators with condensing plant have been ordered from the Metropolitan-Vickers Electrical Co., Ltd. They comprise twelve main sets each of 33,000-kW capacity (40,000 kVA, 0.825 p.f., 10,500 V) at 3,090 r.p.m., and four house sets each of 7,000-kW capacity



An interior view of the Klip power station, showing the first three sets

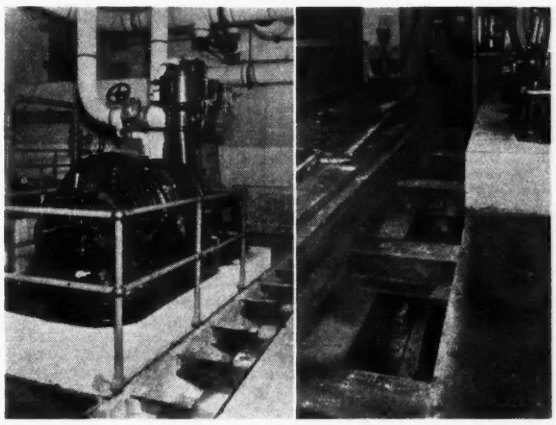
(8,750 kVA, 0.8 p.f., 2,100 V) at 3,090 r.p.m. The aggregate capacity of the sixteen sets will be 424,000 kW, and together with the existing stations at Brakpan, Simmer Pan, Rosherville, Vereeniging, and Witbank, will increase the total capacity of the turbo-alternators operated by the Victoria Falls and Transvaal Power Co., Ltd., to 820,500 kW. The Klip and Witbank stations are the property of the Electricity Supply Commission of South Africa and are operated on behalf of the Commission by the Victoria Falls and Transvaal Power Co., Ltd.

A Staff Pension Scheme

A pension scheme has been introduced for more than 1,000 staff employés of Pinchin, Johnson and Co., Ltd., and its English and Scottish subsidiaries. The scheme will be operated by the Eagle Star Insurance Co., Ltd. The company already has a group life insurance scheme which has been in operation for fourteen years.

Solving a Vibration Problem

The use of flexible mountings for preventing the transmission of vibration is by no means confined to internal combustion machinery. The vibratory frequency of a 140 h.p. reciprocating steam engine, directly coupled to an electric generator in one of the laundries owned by Loud and Western, appeared to be magnified when transmitted through the sub-



A generating set in operation in a laundry showing (right) the floor boards removed so that two of the "Silentbloc" mountings beneath the steel longitudinals can be seen

soil to a row of private houses nearby. The nuisance was abated by mounting the set on a series of twenty-eight "Silentbloc" anti-vibration supports, each of which consists of two concentric tubes between which moulded rubber is stretched, so that both tubes are located by the pressure of the rubber and without any need for cement. The outer tube has a suitable flanged base, while the smaller inner tube carries the load. The power unit has been mounted on a substantial concrete raft in which seven "H" section steel girders have been embedded. The outer ends of these girders are bolted to a pair of steel longitudinals of similar section. Beneath these are placed the "Silentbloc" mountings, which are staggered and comprise a double row of fourteen on each side. The combined weight of the raft, engine and generator is approximately thirty tons.

Electricity at Denham Studios

Referring to the description of the electrical equipment at the London Film Studios, Denham, in our August 19th issue (page 255), Smith & Hammond, Ltd., tell us that they carried out the whole of the installation work, in co-operation with Unity Heating, Ltd., and Capt. Young, the chief engineer of London Film Productions.

Two Useful Manuals

Two publications on modern radio developments have made a timely appearance. They are "A.B.C. of Automatic Tuning," by W. E. Miller, B.A. (Cantab.), who reviews the Radio Exhibition in this issue, and "The Television Trader," written

for and compiled by the *Wireless & Electrical Trader*. Both are eminently practical manuals designed for the radio engineer and dealer and service engineers. They are published at 1s. each, post free, by the Trader Publishing Co., Ltd., Dorset House, Stamford Street, S.E.1.

Educational

Enrolment begins on September 19th for evening classes in all branches of engineering at Northampton Polytechnic, London, E.C.1. Entrance examinations for day courses will be held on September 22nd and 23rd.

The day department of the Polytechnic, Regent Street, W.1, reopens on September 20th, and the evening departments on September 26th. (See our classified advertisements.)

New Catalogues and Lists

Higgs Motors, Ltd., Witton, Birmingham, 6.—Additions to the company's catalogue, including details of industrial electric motors, fractional h.p. motors, induction motors, plain bearing machines, d.c. dynamos and gear units.

D. Walter & Co., Ltd., 61-63, Lant Street, London, S.E.1.—A catalogue describing weatherproof floodlights and spotlights, and underwater and colour-changing floodlights. Also a well-produced brochure giving particulars of modern theatre and cinema lighting equipment. The illustrations include a number in colour.

Davidson & Co., Ltd., Sirocco Engineering Works, Belfast.—A new publication (SF.212), entitled "Sirocco Products for Chemical and Allied Manufacturing Processes" describing fans and mechanical draught plant.

Brown Bros., Ltd., Great Eastern Street, London, E.C.2.—A copy of the first number of the D.S.S.C. Magazine, devoted to the interests of members of the Duco Social and Sports Club.

Ernst Geisel, 118-20, Great Titchfield Street, London, W.1.—An illustrated leaflet describing the new "Day-spect-ray" daylight spectrum desk lamps.

The Harland Engineering Co., Ltd., "B.E.P." Works, Alloa.—Three publications illustrating and describing boiler feed pumps, small and medium d.c. machines, and small a.c. motors, respectively.

Philips Lamps, Ltd., 145, Charing Cross Road, London, W.C.2.—A binder containing leaflets describing the latest X-ray and research equipment manufactured and marketed by the Philips Industrial X-ray Service Laboratories.

Herbert Morris, Ltd., Loughborough.—A booklet illustrating pulley-blocks and their many applications.

The Consolidated Pneumatic Tool Co., Ltd., 232, Dawes Road, London, S.W.6. An illustrated folder relating to the new "Duff-Norton" pipe pushing and pulling jack.

Belling & Co., Ltd., Bridge Works, Southbury Road, Enfield, Mddx.—The 26th annual catalogue of electric fires and cookers, introducing nine new fires.

Renown Electric, Ltd., Regent Works, 524, Radford Road, Nottingham.—A catalogue of lighting fittings, including wood and metal pendants, bracket fittings, ceiling units, glass fittings and shades.

Wallis-Noble, Ltd., 14-20, Regent Street, London, S.W.1.—A folder giving particulars of the Wallis-Trindl battery electric arc welder, the Wallis-Dynamic mains welder and the Wallis-Trindl super industrial arc welder.

Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, North Acton, W.3.—The 1938 broadcast catalogue of condensers and resistances.

British Insulated Cables, Ltd., Prescot, Lancs.—List M.97 of jointing materials and accessories for paper, rubber and bitumen insulated cables.

Thermal Syndicate, Ltd., Wallsend, Northumberland.—An illustrated folder explaining how to use the "Vi-Tan" ultra-violet (a.c.) home unit.

Berry Wiggins & Co., Ltd., Tensulam House, Water Lane, London, E.15.—A booklet containing details of "Aquaseal" bituminous plastic for waterproofing and protecting thermal insulation.

Private Arrangements

H. R. Forward, 26-28, Washwood Heath Road, Saltley, Birmingham, radio dealer, &c.—At the meeting of creditors a statement of affairs was submitted by Messrs. Poppleton & Appleby, accountants, King Edward House, New Street, Birmingham, which showed ranking liabilities of £611. In addition there were fully secured creditors for £1,060. The net assets were £421, leaving a deficiency of £190. The creditors decided to confirm the deed of assignment already executed to Mr. R. F. Bendall, of Messrs. Poppleton & Appleby, with a committee consisting of Mr. A. Cripwell, and the representatives of the Gothic Electrical Supplies, Ltd., and Philco Midland Distributors, Ltd.

R. W. C. Jones, radio and electrical engineer, 55, South Street, Sebastopol, Mon.—The creditors herein were called together on August 26th at the offices of Poppleton & Appleby, 35, Windsor Place, Cardiff, when the statement of affairs showed liabilities of £185. The net assets were £70, leaving a deficiency of £114, The debtor attributed his present position to keen competition and to the fact that wirelsss sets were on numerous occasions auctioned locally at low prices. Resolutions were passed confirming the deed of assignment already executed to Mr. L. S. Findlay, of Poppleton & Appleby, whilst a committee was also appointed, and it was decided that the assets should be realised forthwith.

Bankruptcy Proceedings

J. T. Townson, 97, Market Street, Dalton-in-Furness, radio and electrical engineer.—The first meeting of creditors was held on August 26th at the Official Receiver's office, 16, Cornwallis Street, Barrow-in-Furness, when the statement of affairs disclosed gross liabilities of £406, of which £399 was expected to rank for dividend. The assets were expected to realise £68, leaving a deficiency of £331. Debtor attributed his failure to bad trade since Christmas. The case being a summary one was left in the hands of the Official Receiver as trustee.

W. H. Axworthy, electrical contractor, John Lane, Cobourg Street, Plymouth.—Receiving order made August 23rd on debtor's own petition.

A. W. Sadler, radio engineer and dealer, 115, Osmaston Road, Derby.—First meeting September 2nd, at 22, Regent Street, Park Row, Nottingham. Public examination September 20th at the Court House, Derby.

L. A. W. Steinmetz, electrical dealer, 56, Bromham Road, Bedford.—Trustee, Mr. T. Bengough, 6, The Parade, Northampton, Official Receiver, released August 12th.

S. D. Bennett, electrical engineer, 2, Burnt Ash Parade, Lee, S.E.—Trustee, Mr. C. R. Waterer, 29, Russell Square, London, W.C.1, Official Receiver, released August 16th.

A. L. J. Stanway, radio dealer, 2, The Arcade, Otley.—Trustee, Mr. H. C. Bowling, 24, Bond Street, Leeds, Official Receiver, released August 16th.

J. Bolton, radio dealer, 88 and 90, Bolton Road, Blackburn.—First and final dividend of 6s. 7d. in the £, payable September 6th at 7, Lord Street West, Blackburn.

G. W. Linsell, radio and electrical dealer, Tippendale Lane, Park Street, near St. Albans, lately trading at 26, London Road, St. Albans.—First and final dividend of 4d. in the £, payable September 7th at 4, Charterhouse Square, London, E.C.1.

A. W. Willis, formerly trading as T. Henry & Co., and lately trading at 284, High Road, South Tottenham, N.15, radio dealer.—Receiving order made August 18th on a creditor's petition.

E. W. Pearson, electrician, 59, Bedford Road, Southport.—Receiving order made August 19th on debtor's own petition. First meeting September 2nd at Government Buildings, Victoria Street, Liverpool. Public examination September 27th at the Court House, Government Buildings, Liverpool.

N. G. Crews, electrical engineer, 99, Clapham Road, Lowestoft, lately trading at 34, Crown Street, Lowestoft.—Application for discharge to be heard on September 22nd at the Town Hall, Great Yarmouth.

R. D. Farrant, radio dealer, 196, Archway Road, Highgate, N., lately trading at rear of 543, Holloway Road, London.—Discharge suspended for nine months until April 27th, 1939.

S. J. Miles, radio and electrical engineer, 134, Queen Victoria Road, Coventry.—Bankrupt's discharge refused June 20th. (Notice published August 23rd.)

T. N. G. Gelsthorpe (deceased), electrical merchant's manager, late 46, Devonshire Drive, Scarborough.—First and final dividend of 1s. 10d. in the £, payable August 19th at the Official Receiver's Office, Bank Chambers, Scarborough.

Company Liquidations

Hawkins Brothers & Co., Ltd., wire drawers and electrical wire manufacturers, Basterfield Street, London, E.C., and Vale Road, London, N.—The statutory meeting of the creditors was held on August 23rd at St. Bride Institute, Bride Lane, Fleet Street, London, E.C. Mr. F. Hawkins, one of the managing directors, occupied the chair and reported that the shareholders had passed the usual resolution for the voluntary liquidation of the company and had nominated a liquidator. The statement of affairs showed ranking liabilities of £11,219, of which £4,224 was due to cash creditors and £6,995 to the trade. The net assets were £10,051, leaving a deficiency, as regarded the creditors, of £1,167. The issued capital was £20,707, and so far as the shareholders were concerned there was a deficiency of £21,874. The liquidator said it was with great reluctance that the directors had decided on voluntary liquidation, but they had come to the conclusion that it was impossible to continue. Certain negotiations were taking place and it was believed that a substantial cash offer would be received for a part, if not the whole, of the business. The creditors decided to confirm the voluntary liquidation of the company with the liquidator nominated by the shareholders and a committee of three of the principal creditors was also elected. The following are the principal creditors:—J. Wilkinson & Son, Ltd., £880; G. Liddle, £511; Compagnie Générale d'Electro Metallurgie, £479; P. J. Rokker, £388; F. Willing & Co., Ltd., £290; Fine Cotton Spinners' and Doublers' Association, £279; British Ropes, Ltd., £272; Moss Wire Mills, Ltd., £265; J. Maygrove & Co., £259; Spencer Wire Co., Ltd., £256; R. H. Symonds, Ltd., £239; W. T. Henley's Telegraph Works Co., Ltd., £197; Leband & Co., Ltd., £142; Fernand Espir, Ltd., £140; Exors. of the late Ed. Hawkins, £128; L. Le Personne & Co., Ltd., £155; Willing Wire Co., £112; Southern Wire & Rolling Mills, £101; MacIntyre Hudson & Co., £101.

F. T. Bourbery & Sons, Ltd., 342-348, Uxbridge Road, Shepherd's Bush, London, W.12, radio and electrical engineers, &c.—A meeting of creditors was held recently when Mr. F. T. Bourbery, the managing director of the company, presided. It was stated that an informal meeting of the principal creditors had previously been held, when the opinion was expressed that the company should go into voluntary liquidation. The statement of affairs showed ranking liabilities of £1,994 and the total assets were £780, leaving a deficiency of £1,214. The liabilities included loan creditors for £446 and it was understood that certain of their claims would be withdrawn. Resolutions were passed confirming the voluntary liquidation of the company with Mr. F. E. Bendall, of Messrs. Bendall, Poppleton & Appleby, 4, Charterhouse Square, London, E.C., as liquidator. A committee was also appointed.

H. Austin Storry, Ltd., Palmerston Road, Southsea, and at Portsmouth and Chichester, radio dealers, &c.—The creditors met on August 24th at the offices of Messrs. Percy Mason & Co., C.A., 14, Moorgate, London, E.C. An approximate statement of affairs was submitted as at June 28th last, the date when the debenture holders appointed a receiver. The statement disclosed ranking liabilities of £3,545. The net assets were £1,043, leaving a deficiency, as regarded the creditors, of £2,502. The receiver was continuing the trading and efforts were being made to effect a sale as a going concern. Resolutions were passed confirming the voluntary liquidation of the company with Mr. Webber as liquidator, with a committee.

John White & Sons (Radio), Ltd.—Winding up voluntarily. Liquidator, Mr. O. A. J. Ling, 51, Wardwick, Derby.

Electricity Supply

Lighting, Domestic, Power

Aberdeen.—ENGINEER'S REPORT.—Mr. Alexander Gardner, the borough electrical engineer, in his annual report records a substantial increase in the output of the Electricity Department during 1937-38. During the year 84.9 million kWh was generated, an increase of 9 per cent. on 1936-37. The total sold was 69.4 million kWh, an increase of 11 per cent. Sales of energy under the domestic tariff rose by 21 per cent. and industrial power by 16 per cent. Regarding coal supplies, the average contract price for the current year showed an increase of approximately 1s. 3½d. per ton over that for last year. As compared with three years ago when the charges for electricity were reduced to their present low level, Mr. Gardner points out, the pithead price of fuel supplies showed an increase of no less than 51¼ per cent. On present consumption this represented an increased cost of production of £22,200 per annum, which so far the Department had been able to meet. The total income of the Department for the year was £281,514, an increase of £25,332 on the previous year's figure. Working expenses amounted to £162,824, having risen by £25,297. The gross profit, at £118,690, was slightly higher, but after deduction of interest, loan expenses, and similar charges, the profit on the year's working amounted to £14,909, a reduction of £2,411 on the previous year. There is £132,622 in the reserve fund. Consumers now total 39,058; the number of new applications accepted during the year under the assisted wiring scheme was 1,502. Important constructional and extension work was carried out in all departments of the undertaking during the year in order to meet the increasing demands for electricity, and the report outlines the work done. This included laying the foundations of a new generating set, and the provision of a.c. distribution cables and changing over consumers' apparatus to relieve the heavily loaded d.c. distribution areas.

Accrington.—PROGRESS OF STREET LIGHTING SCHEME.—Gas lamps are giving place to electric, over 750 having now been dealt with. The scheme, which involves the conversion of over 1,200 lamps, may be completed by the end of the year. The decision of the Corporation to convert the town's street lighting from gas to electricity was criticised at a meeting of Accrington and District Gas Board on August 25th. Alderman Barlow said that as heavy ratepayers the Board would have to contribute to the added cost which this conversion would entail. Mr. A. J. Harrison, manager, said the Board could have undertaken the improvement of Accrington's street lighting for a fraction of the cost which the conversion to electricity would entail. The change-over would cause a loss of £1,000 to the gas undertaking, which would have to contribute to the future electric lighting of the borough.

Amble.—OVERHEAD LINES.—The Urban District Council has agreed not to offer any objection to the erection of overhead lines at Radcliffe by the North-Eastern Electric Supply Co., Ltd.

Blackburn.—SUB-STATION PLANS.—The Electricity Committee has decided to apply to the Electricity Commissioners for sanction to borrow £20,000 for capital expenditure on the erection and equipment of sub-stations during the ensuing three years.

Blackpool.—EXTENSIVE ILLUMINATIONS.—Over 400 tons of material is being used for the town's autumn illuminations which extend along five miles of the coast. The cost is estimated at £22,000. New features include four special tableaux on the cliffs at Bispham; an avenue of pylons; an old English garden; high tiered terraces at South Shore Baths; fountains at South Shore; sixty cherry-blossom trees whose branches rise high above the promenade; and a "prehistoric" train hauling a green-scaled monster 20 ft. in height and 75 yd. in length.

Brigg (Lincs).—COUNCIL REFUSES CONSENT.—At its recent meeting the Urban District Council considered a letter from the North Lincolnshire & Howdenshire Electricity Co., Ltd., regarding applications made to the company by 24 tenants of Council houses asking for a supply of electricity. The Council decided that it could not agree to the installation of electricity in the houses.

Canada.—CHEAPER ELECTRICITY.—The index number for the price of electricity for domestic uses in Canada, with 1926 as 100, declined from 85.43 in 1936 to 81.25 in 1937, states a report issued by the Dominion Bureau of Statistics. A drop was shown in every province except Manitoba, where the level was unchanged. The report adds that the lowest net charge for 100 kWh of domestic service was in Port Arthur ($1.13), in Orillia, Ont., it was $1.20, in Fort William $1.57 and in Winnipeg $3.00. In the commercial lighting field St. Catherines, Ont., had the lowest net charge, namely, $10.50 for 1,000 kWh. Orillia was second with $10.80.

Clitheroe.—RURAL DEVELOPMENT.—There was a tour of inspection of 73 sub-stations of the electricity undertaking (including a widespread agricultural and rural area) on August 24th. Councillor G. Dewhurst (chairman of the Electricity Committee) said that of the undertaking's supply area 97 per cent. was rural. The Corporation tried to be of assistance to agriculture, and apparently insurmountable difficulties had been overcome. Agriculture stood in need of development on modern lines, and Clitheroe was out to play its part. If British agriculture was to hold its own its methods would have to be brought up to date. The chairman also gave figures showing the growth of the undertaking. Clitheroe had more electrically heated tar boilers than any district in the country, and electricity was used in the area for a great variety of power purposes, he said.

Darlington.—STREET LIGHTING.—The Town Council is applying for sanction to borrow £1,500 for additional electric lighting in Yarm Road.

Dartford.—NO REDUCTION IN FLAT RATE.—The Electricity Committee is unable to recommend any reduction in the present flat rate tariff of 5½d. per kWh. The engineer reports that one penny off the flat rate would reduce the revenue by about £2,700 per annum and no appreciable increase in consumption would result.

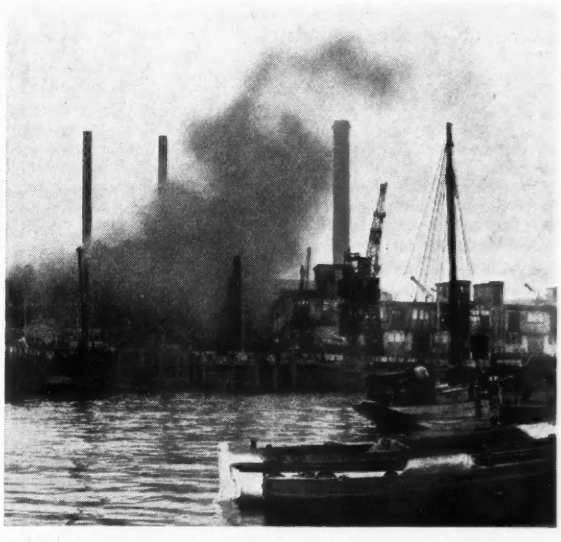
East Suffolk.—POLICY REGARDING OVERHEAD LINES.—At a recent meeting of the County Roads Committee a letter was read from the Lothingland Rural District Council with reference to a proposed electricity supply to Browston, pointing out that difficulties had arisen upon a request being made for the mains to be placed underground and suggesting that the County Council might be able to assist in the matter by providing a trench in the grass verge by the side of the highway and forming a footpath. The Committee considered that in

The Portsmouth Mishap

THE alternator of the 30,000-kW set at the Gunwharf Road power station of Portsmouth Corporation, which was officially put into commission as recently as July 21st, was completely wrecked at 6.30 p.m. on August 25th. Subsequent examination appeared to indicate that the cause of the accident was the bursting of the electrical rotor, which was described in THE ELECTRICAL REVIEW of July 22nd as a solid steel forging weighing 18 tons. It is feared that the steam end of the set was also damaged.

In the station itself the auxiliary switch gallery was severely damaged by flying metal and one panel was destroyed, while a boiler under steam in the adjacent boiler house had three water tubes bent but not broken. Injury to other plant by the heavy missiles was only very slight. Fragments pierced the windows and 80-ft. high roof; one weighing 184 lb. was hurled on to the beach more than a quarter of a mile away, another heavy piece of the plant is known to have fallen into the sea.

At the time of the occurrence the set was carrying 20,000 kW and running in parallel with the grid and two other machines in the station, having been on load for ten days. The grid maintained the supply, subject only to fluctuations in voltage, and the other two sets were re-paralleled and running on load within seven minutes of the disaster, in spite of an outbreak of fire. The effects of the latter, which was efficiently dealt with by the fire brigade, were confined to the machine and connecting cables. Only one man was injured—an erector employed by contractors; he was somewhat severely burnt about his arms and face, but is progressing favourably. Mr. B. Handley, the engineer and manager, was attending the World Power Conference at Vienna at the time, but his staff was able to get into touch with him on the telephone.



The Portsmouth generating station photographed just after the accident

a place of such exceptional beauty as Browston the amenities would be seriously affected by the erection of poles and overhead lines and it recommended that the surveyor should be authorised to confer with the supply authority with a view to rendering assistance in placing the mains underground. The clerk stated that in considering applications by electricity undertakings for consent to the placing of overhead lines he had difficulty in determining the wishes of the County Council as to how far the undertakings should be pressed to amend their schemes on the ground of amenity, and he asked for instructions as to the adoption of a general policy. The opinion having been expressed that, while due regard should be paid to the preservation of amenities, it was essential that the provision of a supply of electricity in rural areas should not be unduly delayed, the clerk was authorised to continue to consent to the erection of overhead lines, submitting to the Committee or the Area Joint Highways Committee concerned applications which he felt required special consideration.

Edinburgh.—PROPOSED SUB-STATIONS.—At Edinburgh Dean of Guild Court on August 26th the Corporation was granted permission to erect a sub-station at Pennywell Road, and T. and H. Smith, Ltd., had plans passed for a sub-station at Blandfield Chemical Works, Wheatfield Road.

France.—ELECTRICITY PRODUCTION IMPROVES.—During June, with twenty-five working days, the sixty-nine largest power companies produced 1,096.7 million kWh against 994.3 million in the corresponding month of last year, with twenty-five working days, an increase of 10 per cent. In the first half of the year there has been an improvement of nearly 8 per cent.

Garstang.—LIGHTING SCHEME.—The Parish Council has accepted the tender of Preston Corporation Electricity Department for an extension of the latter's cable for street illumination.

Guisborough (Yorks).—STREET LIGHTING.—The Urban District Council has under consideration plans for street lighting at Newton-under-Roseberry, Lackenby, Dunsdale and Wilton.

Heckmondwike.—ELECTRICAL ACTIVITY.—At a recent meeting of the Council it was decided to apply to the Electricity Commissioners for permission to borrow £22,578 to complete the change-over of the supply system, meet the cost of mains extensions, and develop property in the Market Place as a showroom, demonstration room and offices. Dr. H. S. Houldsworth, chairman of the Electricity Committee, described the past year as a very busy one. He mentioned particularly the growth in the domestic load and the provision of new street lighting by electric-discharge lamps. There was a profit on the year's working of £2,114.

Heywood.—AIRCRAFT FACTORY NEGOTIATIONS.—The Electricity Department has been invited by the Air Ministry to supply details of what facilities are available if the Ministry decides—as is hoped in the borough—definitely to proceed with a scheme for the construction of an aircraft-equipment factory in the borough. During the summer two officials spent a fortnight exploring the possibilities of Pilworth suburb as a site. The estate covers 200 acres, and the works would employ 5,000 people within fourteen months. Considerable electrical developments would be required, not only for the actual factory, but also for road lighting and for the houses that would have to be built in the neighbourhood.

Latvia.—THIRD TURBINE TO BE INSTALLED AT KEGUMS.—It is reported that Karlstads Mekaniska Verkstad recently obtained an order for a third turbine for the big Latvian power plant at present under construction at Kegums, near Riga. Through the extension the Kegums plant will be able to deliver considerably more power than was originally planned. It is the intention of the Latvian Government to install a fourth set later, and it is estimated that the station will then be able to meet the country's whole requirements.

Liverpool.—SODIUM LIGHTING.—Steady progress is being made by the Street Lighting Department with the scheme to illuminate the main roads of the city from the boundary to the centre with sodium lamps. The city already has over 28 miles of sodium lighting (1,600 lamps). The Norris Green district is in process of encirclement with the new lighting. Another stretch is from the Prescot boundary to Sefton Park, a distance of over six miles, which will be completed by the end of the year; this section will be controlled by one switch. It is the policy of the Liverpool Corporation to replace gas lighting with electric lighting wherever the opportunity offers and finance permits.

Morecambe and Heysham.—ILLUMINATIONS.—The autumn illuminations switched on last Friday by Miss Margaret Vyner, an Australian film actress, include a number of new features. Set-pieces "Snow White and the Seven Dwarfs" and "King Neptune" are musical schemes and are synchronised with special gramophone records.

Spilsby.—RURAL SUPPLIES.—The desirability of obtaining supplies of electricity for the use of villages in the district was emphasised at the recent monthly meeting of the Rural District Council. Further efforts are to be made to obtain supplies from the Mid-Lincs Company. One member stated that he himself was supplying electricity from a private source to certain Council houses at Burgh and inquired whether it was necessary to deal with a supply company.

Stalybridge and District.—LOWER CHARGES.—The Stalybridge, Hyde, Mossley and Dukinfield Transport and Electricity Board proposes to put into operation a reduced scale of "all-in" electricity tariffs for domestic consumers, as from the September quarter meter readings. For the first time in the Board's history there is to be a discount on all tariffs of 1¼ per cent. for prompt payment. Under the new scale the fixed charge on a house of £12 rateable value remains the same, but the energy scale has been reduced from 600 to 500 kWh at ½d. per kWh, and thereafter to ¼d. For houses of higher rateable value there are greater reductions. For instance, on £35 rateable value instead of paying £1 6s. 3d. fixed charge per quarter the consumer will pay £1 3s. 9d. Under the combined business and domestic tariff there are fixed charge concessions, and the energy charge is 500 instead of 1,200 kWh at ½d., and thereafter ¼d. per kWh. Under their new tariff doctors and dentists get a reduction in the fixed charge on the rateable value of their houses. The charge for energy will be ¾d. per kWh for the first 240 kWh as hitherto, but the next 800 (instead of 1,750) kWh will be at ½d. per kWh, and all in excess at ¼d. per kWh.

Sunderland.—ILLUMINATIONS.—The annual illuminations display of the Town Council will take place from September 10th to October 9th.

Sutton Coldfield.—ELECTRICAL PROGRESS.—During the year ended March 31st last the Electricity Department sold 12.4 million kWh, 17 per cent. more than in the previous twelve months. Notwithstanding the general increase in wages and cost of materials the total generating costs decreased from 0.566d. to 0.551d. per kWh. At the end of March there were 10,255 consumers, an increase of 968 during the year. Per head of the population the sales of electricity, excluding public lighting, averaged 262 kWh, 81 per cent. of the premises in the area being connected to the mains. During the year 109 additional electric lamps were erected, making the total number in service 1,637. Experiments were carried out with modern fittings and methods of control.

ENGINEER'S COMMENTS.—Referring in the report to the change-over from d.c. to a.c. the borough electrical engineer and manager (Mr. T. Bloore) states that the expenditure necessitated by the change of system, from which the Department is obtaining no immediate benefit, is a serious item in the capital charges and will continue to be for some years to come. He advises caution against unnecessary commitments in this respect.

Wallasey. — DECORATIVE LIGHTING. — The Corporation's promenade illuminations scheme, on which £900 has been spent, was switched on last week. About half of the total cost has been allocated to the floodlighting of the flower bed and the trees at the promenade entrance to Vale Park.

Traction

Finland.—RAILWAY ELECTRIFICATION.—Mr. Jalmar Castren, Director-General of the Finnish State Railways, has submitted a plan to the Government regarding railway electrification during the next five years. It is proposed to electrify the Elisenvara-Tainionkoski-Villmanstrand-Simola-Viborg railway and the important line Helsinki-Viborg, which connects the capital with one of the biggest provincial cities.

Germany.—TROLLEY-BUSES REPLACE TRAMWAY.—A 3½-mile line of electric tramway in Leipzig has lately been superseded by a number of 50-seater trolley-buses.

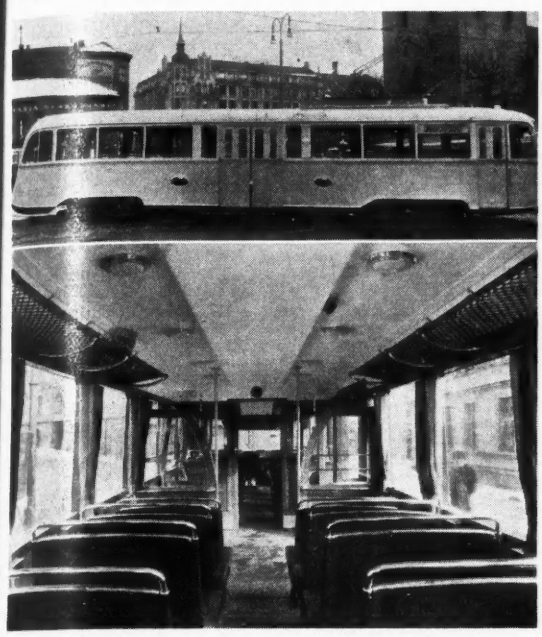
Glasgow.—RETENTION OF TRAMWAYS RECOMMENDED.—Following an investigation by officials and members of Glasgow Corporation Transport Committee into trolley-bus undertakings in England, Mr. Robert F. Smith, general manager, has prepared a report. Mr. Smith, it is understood, suggests that the tramway system is unchallengeably superior for Glasgow transport to any other form of traction, and that there should be a settled policy of development by rebuilding tramcars. The original purpose of the inquiry was to consider an experimental trolley-bus service in Glasgow, but the report is understood to approach the question from the point of view of replacing the entire tramway system by trolley-buses. Members of the investigating committee visited London and Manchester. Summarising his conclusions against the introduction of trolley-buses in the city, Mr. Smith states that the operating costs are likely to be increased; it is estimated that the capital charges would be raised by £295,000 per annum; higher road charges would fall on the ratepayers, and a sum of £489,988 would have to be spent on reinstating the roadways. With regard to capital expenditure, if the Corporation embarked on the new system, Mr. Smith states that the cost of 1,200 trolley-buses would be about £3,000,000 and the estimated cost of extra electrical equipment for them would be nearly £1,000,000.

Italy.—NEW ELECTRIC ROLLING STOCK.—Within recent months the Italian State Railways has placed orders for 122 electric locomotives and 78 motor-coaches for service on the 3,000-V d.c. lines.

Norway.—RAILWAY ELECTRIFICATION.—It has been decided to electrify the railway lines from Halden to Kornsjo, Skien to Moss and Moss to Fredriksstad. Work is already in progress on important sections of the lines, and all-electric operation of trains on the Halden-Kornsjo line, which connects

with the Swedish electric railway system at the frontier, is scheduled to be introduced as from the autumn of 1939. Anticipating the forthcoming adoption of electrical operation, the Norwegian State Railways have ordered light electric locomotives from A/S Norsk Elektrisk and Brown Boveri, the value of this contract being the equivalent of £180,000. They will have a maximum speed of 70 m.p.h.

STREAMLINED TRAMCARS.—A new design of modern streamlined lightweight tramcar has been produced by the Norwegian company, A/S Strommens Verkstad, and six cars of this type have recently been supplied to the municipal transport company at Oslo. The bodywork of the new cars is of duralumin throughout. Electric heaters are placed under



Two views of one of the new Oslo tramcars

every seat, and the compartments are fitted with an air-conditioning system controlled from the driver's seat. The cars are 15.4 metres long, 2.5 m. wide, 3.03 m. high over rail and weigh 13.06 tons. Designed for unidirectional operation, they have doors in one side only, viz., a double folding door in the middle of the car and one folding door in the driver's compartment, both operated by compressed air. The electrical equipment has been supplied by Metropolitan-Vickers, Norsk Elektrisk and Brown Boveri, Siemens, and Allgemeine Elektricitäts Gesellschaft. The bogies are of a special construction of all-welded steel frame. Five of the cars are fitted with hollow axles and lightweight wheels, while the sixth is equipped with a special bogie which has a longitudinally placed motor with conical gears at both ends.

South Africa.—COMPLETION OF RAND SCHEME.—With the opening to electric traction in the middle of October of the Pretoria-Germiston main line, the 3,000-V, d.c. Rand electrification scheme of the South African Railways, covering 131 route miles, will be completed. Conversion work is now proceeding on the coastal suburban line to the north of Durban.

United States.—LIGHTWEIGHT SUBWAY CAR.—The motors and control and auxiliary electrical equipment for a lightweight-type car to be placed in experimental service on the New York Subway will be similar to those used on P.C.C. tram cars, according to the American General Electric Co., which will supply the equipment. The car will be streamlined and articulated, with four trucks supporting its three body sections, totalling 80 ft. 4 in. in length. It will be designed and equipped throughout to operate at high speed with the minimum of noise. Eight 300/600-V motors will be used, with two floating control equipments employing the commutator-type controller, dynamic braking, and magnetic track brakes. The equipment will provide acceleration rates up to four miles per hr. per sec., and dynamic braking up to the same value. Higher braking rates can be obtained when needed by applying track and air brakes in addition to the dynamic braking. Low-voltage energy for the control, track brakes and auxiliary equipment will be provided by two motor-generator sets. The car, a distinct departure from types now in use, will be built of aluminium alloy, and will be equipped with rubber-cushioned wheels and springs. There will be non-glare high-intensity lighting, and a constant forced circulation of filtered air will be maintained by a mechanical ventilation system. The total carrying capacity will be 318 passengers. Provision is made in the electrical equipment for multiple unit operation of up to seven cars in a single train.—*Reuter's Trade Service.*

Communications

Great Britain.—TELEVISION PLANS.—At a conference held at Olympia last week between the B.B.C. and 1,500 radio dealers a campaign which aims at getting television into 100,000 homes was discussed. It was stated that the B.B.C. would build a new television studio and convert the Alexandra Palace theatre to studio purposes as soon as the public demand justified the increased facilities. Sir Noel Ashbridge, chief engineer to the B.B.C., said that there would be no fundamental changes in the television transmission system for some years.

Norway.—GROWTH OF COMMERCIAL RADIO.—Two new commercial short-wave transmitters are being erected in Norway. One is a 25-kW station on a site near Jeloy, Oslo, designed for operation on 30 and 50 metres, while the other is a 5-kW transmitter at Bergen constructed for operation on 27.86 metres. The latter is chiefly intended for daily news bulletins transmitted to Norwegian merchant vessels at sea. A new radio-telephony station for ship-to-shore communication has been built at Ingoy, North Norway, and a similar station is in course of construction at Vardo, while the construction of a third transmitter will shortly be commenced at Bodo. All three stations are designed for duplex telephony. Four radio beacon transmitters are being built on the Norwegian coast between Stavanger and Bergen, *viz.*, at Grodheimhammeren, Fjelloy, Klepp and Kopervik.

Sweden.—ALL METROPOLITAN TELEPHONES AUTOMATIC.—The recent inauguration of another automatic telephone exchange in Stockholm marked the completion of a scheme commenced in 1921 to adopt fully automatic operation of all metropolitan telephones. The new network, which has cost the equivalent of about £2,800,000 so far, comprises seven automatic exchanges serving 136,000 subscribers' instruments, the total capacity of the system being 180,000 subscribers.

Electrification of the Paris-Bordeaux Line

NEXT month the electrification of the final section of the Paris-Bordeaux railway line—from Angoulême to Bordeaux—is expected to be completed, but the whole line is not likely to be electrically operated until the end of the year owing to the necessary trial period of at least two months.

It may be recalled that this line formed part of the big railway electrification scheme that the old railway systems were asked to submit to the Minister of Public Works in 1932. That scheme also included the Paris-Le Mans, Paris-Havre, Narbonne-Port Bou, Brive-Montauban and Bordeaux-Montauban lines. The work was to be spread over eight years, but no line was to be electrified unless the operation was found likely to be profitable. The first works to be carried out were decided upon in 1934 in the shape of a big plan for combating unemployment, known as the Marquiet plan, the Paris-Le Mans and Bordeaux lines representing the first part.

The Tours-Bordeaux railway is a double line 347 kilometres long carrying heavy traffic. When it is converted to electrical operation (the section from Tours to Angoulême was recently opened to electric service) the 824-km. line from Paris to Irun, on the Spanish frontier, will be electrified from one end to the other. The plans for the electrification of the Tours-Bordeaux section were submitted to the Government in September, 1935, and approved in the following November. By the end of 1938 it will thus have taken three years to electrify a line covering nearly half France.

The sub-stations will be fed by a 90-kV cable following the route of the railway. At its northern end it is linked up with the Epines-Fortes sub-station near Tours, and at its southern end with the Pessac transforming station, near Bordeaux. It is fed with electricity at two intermediate points at the Chaumon sub-station, near Poitiers, and the Fléac station, near Angoulême. The power for the sub-stations is derived from the Marèges and Coindre power stations in the Massif Central. The supply will be distributed to the lines by fourteen sub-stations. At all the sub-stations the starting and stopping of the traction sets will be effected by an automatic equipment similar to that used on the Orléans-Tours and Vierzon-Brive lines.

There is no doubt that the electrification of the Tours-Bordeaux line will mean a distinct improvement in the important railway communications between Paris, the south-east of France and Spain, both as regards the speed of the trains and the comfort of the passengers. Moreover, the south-west region of the Société Nationale des Chemins de Fer will be able to effect appreciable economies, at the same time contributing by its installations to the development and extension of the general work of electrification in France.—*Reuter's Trade Service.*

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Australia.—MELBOURNE.—September 6th. Posts and Telegraphs Department. Cable. (T. 25622/38.)*
October 4th. Four ringing motor-generator units and ringing convertors. (T. 26139/38.)*
September 13th. Telephone plugs and sleeves. (T. 25673/38.)* Accumulator plates and separators. (T. 25892/38.)* Insulated jumper wire. (T. 25893/38.)*
VICTORIA.—October 4th. State Electricity Commission. 132,000-V outdoor switchgear and accessories. (T.Y. 26120/38.)*
October 11th. 66-kV switchgear and accessories. (T.Y. 26120/38.)*
October 18th. 6.6-kV metal-clad switchgear and accessories. (T.Y. 26243/38.)*

Bideford.—September 9th. Town Council. Installation of electric lighting points at buildings in connection with an open-air swimming pool. Town Clerk.

Birmingham.—September 30th. Electric Supply Department. Three-phase transformers up to 1,000-kVA capacity. (See this issue.)

Cardiff.—September 12th. Electricity Department. 33,000-V and other p.i. cables, one six-panel and one two-panel switchboard, two 10,000-kVA and one 7,500-kVA transformers. (August 26th.)

Carlisle.—Sepember 19th. Electricity Undertaking. Tungsten filament electric lamps for street lighting, traffic signals and general purposes. (See this issue.)

Cheadle and Gatley.—September 12th. Electricity Undertaking. Meter-testing equipment. (August 26th.)
September 19th. Electricity Department. Extensions to 6.6-kV switchgear for the Valley Road sub-station. (See this issue.)

Chesterfield.—September 12th. Electricity Department. E.h.v., p.i., lead-covered and steel wire armoured cable. (See this issue.)

Coventry.—October 22nd. Electricity Department. One 30,000-kW turbo-alternator and auxiliary plant. Two water tube boilers, auxiliary plant and buildings. (See this issue.)

Darlington.—September 15th. Electricity Department. Fifty-five mercury vapour electric discharge street lamps. (August 26th.)

Dartford.—September 24th. Corporation. P.i., lead-covered and armoured cable. (See this issue.)

Dewsbury.—September 5th. Borough Council. Electrical stores. (August 26th.)
September 7th. Electrical wiring of 150 houses on the Canterbury Road housing site. Town Clerk, Town Hall.

Eastbourne.—September 10th. Borough Council. Complete electrical installation, telephone conduits, &c., at the new girls' secondary school, Eldon Road. (August 26th.)

Edinburgh.—September 7th. Corporation. Installation of electric lighting at Calder Road school. Town Clerk.
September 6th. Installation of electric lighting and power in Water Department offices, Cockburn Street. Town Clerk (deposit £1 1s.).

Egypt.—ALEXANDRIA.—September 20th. Ports and Lighthouses Administration. One combined pumping and generating set. (T.Y. 25977/1938.)*

Fife.—September 13th. County Council. Electrical installation at offices, 13, Queen Street, St. Andrews. G. Sandilands, county master of works, County Offices, Kirkcaldy (deposit £1 1s.).

Huddersfield.—September 7th. Passenger Transport Committee. Electrician's work in connection with erection of administration block, trolley vehicle depot, Longroyd Bridge. Town Clerk, Town Hall (deposit £2 2s.).

Irvine (AYRSHIRE).—Town Council. Electric lighting for 168 houses (Clark Drive housing estate). Town Clerk (deposit £1 1s.).

London.—COMMISSIONERS OF H.M. WORKS.—September 2nd. Steel conduits and fittings for electric wiring. (August 19th.)
METROPOLITAN WATER BOARD.—September 21st. One high-compression heavy fuel-oil engine with electric generator and centrifugal pumps, one borehole pump, &c., at Wansunt pumping station. G. F. Stringer, Clerk of the Board, 173, Rosebery Avenue, E.C.1.

Manchester.—September 7th. Electricity Department. One electrically propelled van. (August 19th.)
September 16th. Three-phase, 6,600-V switchgear over a period of two years. (August 26th.)
October 7th. Supervisory control equipment at sub-stations. (August 26th.)

Margate.—September 5th. Borough Council. Electrical plant for the Corporation's sewage pumping station, Foreness Point. (August 26th).

New Zealand.—WELLINGTON.—Public Works Department. November 8th. 3,320 strings of e.h.v. transmission line suspension and strain insulators. (T. 25527/38.)*
October 18th. One 1,000-kVA three-phase transformer. (T. 26119/38.)*
September 20th. 460-V single-core cable, 10-kV, single- and three-core cable and 250-V, two, four-, six- and twelve-core control cable. (T. 26115/38.)*
October 11th. Three rotary d.c. welding plants. (T. 25313/38.)*
October 25th. Diesel-electric generating set and switchgear. (T.Y. 25941/38.)*
October 11th. Posts and Telegraph Department. 140 tons of cadmium copper wire. (T. 25553/38.)*
October 11th. Telephone cable. (T. 25936/38.)*
CHRISTCHURCH.—September 29th. Municipal Electricity Department. Sixteen 333-kVA, single-phase transformers. (T. 25943/38.)*

Northumberland.—County Council. Electrical installation at new senior Council school at Alnwick. County architect, County Hall, Newcastle-on-Tyne.

Northern Ireland.—BELFAST.—September 9th. Electricity Department. Electric water-heating equipment and a.c. motors and wiring to replace existing d.c. installation at consumer's premises. (August 26th.)

South Africa.—JOHANNESBURG.—September 12th. Railways and Harbours Administration. Electric lamps for twelve months. (T. 25856/38.)*
September 29th. Union Tenders and Supplies Board. Detectors. (T. 25862/38.)*
MOSSEL BAY.—September 24th. Municipality. Generating plant, transformer and cable. (T. 25577/38.)*
PRETORIA.—September 22nd. Public Works Department. Refrigerating plant at Mortuary, Roodepoort. (T. 26022/38.)*

Stockton-on-Tees.—Town Council. Electric lighting and power installation at the Junction Road senior girls' school. Borough engineer, Town Hall.

Tobermory.—September 6th. Town Council. Electric lighting at housing estate. Town Clerk (deposit £1 1s.).

Uruguay.—MONTEVIDEO.—October 13th. Electricity Supply and Telephones Administration. Insulated copper conductors (Hackethal type). (T.Y. 25971/1938.)*
October 14th. 100,000 kg. bare copper conductors. (T.Y. 25970/38.)*

Wakefield.—September 5th. Lighting installation at Thorne school. Education officer, County Hall.

Wolverhampton.—September 23rd. West Midlands J.E.A. Electrical installation at Ironbridge generating station, Buildwas, near Ironbridge, Salop. (August 26th.)

Warrington.—September 19th. Electricity Department. E.h.v., l.v., p.i., lead-covered and other cables. Earthenware conduits and reinforced concrete cable protector slabs and tiles for twelve months. (See this issue.)

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Bedlington.—U.D.C. Accepted. Electric lighting of sixty-four houses at Guide Post and 142 houses on the Scotland Gate estate.—R. A. Hudson.

London.—L.C.C.—Wiring and fittings for electric lighting, &c., in 806 dwellings at Becontree:

	£		£
Holliday and Son (Electrical). Accepted	**6,070**	Pinching and Walton	6,552
Newman and Watson	6,071	Springvale Electrical Co.	6,726
Ryland's Electrical Co.	6,139	Jacob, White and Co.	6,741
Ilford Electrical Co.	6,485	Evans and Shea	7,188
		Dyne and Co.	11,412

Electrical installation at the South-Eastern Hospital, New Cross:

	£		£
Read and Partners. Accepted	**9,055**	T. Clarke and Co.	10,345
Troughton and Young	9,333	A. Hawkins and Sons	10,449
Electrical Installations	9,485	Malcolm and Allan (London)	10,454
Holliday and Son (Electrical)	9,681	B. French	10,508
Archibald Meckhonik	9,891	Buchanan and Curwen	10,783
Samuel Reed and Sons	9,926	F. H. Wheeler and Co.	10,793
City Electrical Co.	9,981	W. J. Furse and Co. (London)	11,018
Bower Engineering Works (Electrical and General)	10,293	G. E. Taylor and Co.	11,374
		Pinching and Walton	11,433

Wiring and fittings for an electrical installation in two blocks and the main covered ways at St. Giles' Hospital, Camberwell:

	£		£
Holliday and Son (Electrical). Accepted	**1,801**	H. J. Cash and Co.	1,982
Bower Engineering Works (Electrical and General)	1,809	Archibald Mechonik	1,993
Read and Partners	1,856	G. E. Taylor and Co.	2,019
Atozed (London)	1,892	Malcolm and Allan (London)	2,050
T. Clarke and Co.	1,915	Jacob, White and Co.	2,097
F. H. Wheeler and Co.	1,950	F. G. Edey and Co.	2,281
City Electrical Co.	1,969	W. H. Gaze and Sons	2,470
		Davis Myer and Co.	2,490

Wiring and fittings for electric lighting, power sockets and clock points in three blocks at Southern (Upper) Hospital, Dartford, Kent:

	£		£
Read and Partners. Accepted	**936**	F. G. Edey and Co.	1,269
Pinching and Walton	964	Carr Brothers	1,041
T. Clarke and Co.	965	Archibald Meckhonik	1,042
H. J. Cash and Co.	988	Duncan Watson (Electrical Engineers)	1,095
Francis Polden and Co.	997	A. J. Hewens and Sons	1,257
Jacob, White and Co.	1,025		
Service Electric Co.	1,029		

Wiring and fittings for an electrical installation in three wards, gate lodge block, &c., at St. Mary Abbots Hospital, Kensington:

	£		£
Duncan Watson (Electrical Engineers). Accepted	**457**	Collins Electrical	690
Bower Engineering Works (Electrical and General)	481	Leonard G. Tate and Co.	698
F. Troy and Co.	495	W. H. Gaze and Sons	762
Blackburn, Starling and Co.	503	Carr Bros.	790
		Gillham and Jones	820

Wiring and fittings for electric lighting, supplementary heating and power at Richard Cobden School and schoolkeeper's quarters:

	£
Electrical Installations. Accepted	**1,027**
Pemberton and Sturgess (Great Britain)	1,116
Berkeley Electrical Engineering Co.	1,145
Collins Electrical	1,150
F. Troy and Co.	1,154
Houchin	1,246
Buchanan and Curwen	1,270
Arthur Cozens	1,335
Bailey and Incledon (1930)	1,448

Lighting and wiring at South Grove School:

	£		£
Ilford Electrical Co. Accepted	**1,138**	Jacob White and Co.	1,290
Holliday and Son (Electrical)	1,186	Archibald Meckhonik	1,500
Atozed (London)	1,204	J. H. Plant	1,548
Warren Smith and Co.	1,258	Buchanan and Curwen	1,564
G. E. Taylor and Co.	1,262	F. Troy and Co.	1,566

Torquay.—General Purposes Committee. **Accepted.** Internal telephone system at Town Hall extension (£37 8s. per quarter for 10 years).—Dictograph Telephones.

Personal and Social

Information regarding new appointments and other matters of interest for this page are welcomed

ON August 26th Mr. H. Midgley, city electrical engineer, on behalf of the employés of the Plymouth Corporation Department, presented a canteen of cutlery to **Mr. W. A. Gallon**, the chief assistant, who is leaving Plymouth on his appointment as assistant electrical engineer at Southampton. **Mr. C. Hocking**, mains engineer, who has been appointed chief assistant in succession to Mr. Gallon, Mr. F. Lamb, consumers' engineer, and Mr. G. F. Cavendish Land, chief clerk, joined in the good wishes expressed to Mr. and Mrs. Gallon on behalf of the various sections of the Department. Mr. Gallon, in replying, expressed his thanks for the gift and also for the co-operation he had received from all branches of the Department during the four years he and Mrs. Gallon had been at Plymouth.

At the sectional meeting of the World Power Conference in Vienna, which concludes to-day, a number of papers have been presented by British engineers well known in the electrical industry. These include the following:—"The Supply and Use of Electricity in the Home," read by Mr. J. W. Beauchamp; a paper presented jointly by Mr. J. N. Waite (Central Electricity Board) and Mr. F. H. Clough, C.B.E. (assistant chief engineer to the British Thomson-Houston Co., Ltd.) on "The Supply of Electricity for Small-Scale Industries"; "Electric Lighting for Streets and Transport," by Mr. W. J. Jones (E.L.M.A.); "The Supply of Electricity for Agriculture," by Mr. C. A. Cameron Brown (technical expert on rural electrification, E.R.A.); and "The Requirements and Supply of Energy for Electric Railways," by Mr. F. Lydall, of Merz and McLellan. A paper on "Street Lighting" was also presented by Dr. H. F. Gillbe, secretary to the Ministry of Transport Departmental Committee concerned.

British electrical engineers who have presented papers at the sectional meeting of the World Power Conference in Vienna. Top row (left to right): Messrs. J. N. Waite (*Elliott and Fry*), **C. A. Cameron Brown, and W. J. Jones** (*Elliott and Fry*). **Bottom row: Messrs. J. W. Beauchamp, F. H. Clough** (*Lafayette*), **and F. Lydall** (*Killick and Abbot*)

Mr. L. M. Glancy has been appointed a director of Thorn Electrical Industries, Ltd.

Mr. B. G. Davies, of 30, Cornwall Road, Newport, Mon., previously with the English Electric Co., Ltd., has been appointed as sales representative for Thermovent convection heaters, manufactured by E. K. Cole, Ltd. He will cover South Wales and the West Country.

After twenty-one years on the staff of the Whitby Urban District Council electricity undertaking **Mr. C. Townsend** has left for India to take up a post as resident electrical engineer with T. A. Martin & Co., of Calcutta. A presentation has been made to him on behalf of the staff of the Electricity Department and from the local branch of the National Association of Local Government Officers.

Mr. G. T. Pearce, late area manager for Apex-Vactric, Ltd., has now joined the sales staff of the Sun Electrical Co., Ltd., as a special representative to promote the sales of vacuum cleaners, floor polishers, washing and ironing machines, and refrigerators.

Mr. E. M. Hall, technical director of the Western Electric Co., has returned to London from an extensive business visit to the New York and Hollywood offices of Electrical Research Products, where he reviewed current equipment developments in both the reproducing and recording fields.

Many of our readers will wish to join us in our congratulations to **Dr. P. Dunsheath**, O.B.E., M.A., D.Sc., a director of W. T. Henley's Telegraph Works Co., Ltd., on his marriage to Miss Joyce Houchen which took place on August 24th at St. Anselm's Church, Hatch End, Middlesex.

On his recent retirement from the meter department of the Plymouth Corporation electricity undertaking **Mr. A. Smith**, who has reached the age limit of sixty-five, was presented by his colleagues with an electric clock and a reading lamp. Mr. Smith has served for several years on the Plymouth District Committee of the Amalgamated Engineering Union.

Mr. J. W. Piggott has completed twenty-five years' service as electrical engineer at Whitby. To mark the occasion a presentation has been made to him on behalf of the staff of the Electricity Department.

Mr. E. G. H. Jeffery, of Beckenham, has been appointed junior engineer in the mains department with the Hastings Corporation Electricity Department.

Mr. A. Taylor, commercial and sales engineer with the Heckmondwike Urban District Council electricity undertaking, has been appointed electrical engineer and manager of the undertaking in succession to **Mr. W. Parrett**, who is leaving the service of the Council at the end of October.

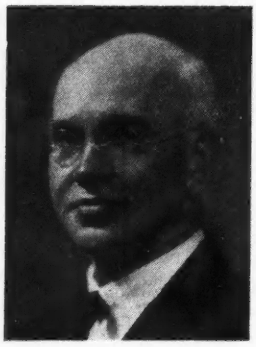
Mr. A. J. A. Owen, of Gravesend, has been appointed consumers' engineer with the Clacton Urban District Council Electricity Department.

Mr. A. E. Somers, who was recently appointed managing director of Ismay Industries, Ltd., has now also joined the board of A. C. Cossor, Ltd.

Mr. H. Jones, chief electrical engineer of the Southern Railway, is retiring this month and will be succeeded by **Mr. A. Raworth**, the present electrical engineer for new works. The Electrical Engineer's and New Works Departments will be combined under Mr. Raworth.

Mr. W. Finlay recently intimated to the Central Board of the Electrical Contractors' Association of Scotland that owing to other business demands on his time and to the state of his health he could not continue to give as much personal attention to the affairs of the Association as he had done in the past and accordingly he tendered his resignation as general secretary and adviser of the Association. The central board co-opted such of the past presidents of the Association as were available for consultation and the augmented Board unanimously resolved to appoint **Mr. Muir P. Finlay**, W.S., Edinburgh, general secretary and treasurer of the Association and they requested Mr. W. Finlay to continue to act in a consultative capacity and, in the meantime at least, to be one of the representatives of the Association on the various joint commit-

tees of the industry, and he agreed to do so. All communications on Association business should now be addressed to the general secretary. Mr. W. Finlay's connection with the Association goes back to 1905 when he was elected secretary of the Edinburgh branch of the Electrical Contractors' Association which then was one body covering England, Scotland and Ireland. He acted as adviser to the Scottish Sectional Board of that Association until 1911 when the Electrical Contractors' Association of Scotland was reformed and, thereafter, he advised that Association on its commercial affairs. In 1919, on the resignation of Mr. J. M. Davies, Glasgow, he was appointed to undertake the general secretaryship also.



Mr. W. Finlay

[Lafayette

Mr. M. P. Finlay

Mr. M. P. Finlay, the new general secretary, is the only son of Mr. W. Finlay. He was educated at Edinburgh Academy and Edinburgh University where he graduated M.A. in 1932 and LL.B. in 1934. He served his apprenticeship with his father and was admitted a member of the Society of Writers to H.M. Signet in 1936. In recent years he has assisted his father in the conduct of the affairs of the Association and for the past three years he has been secretary of the Scottish Committee of the N.R.E.I.C.

An interesting event has just taken place at Albion Works, Sheffield, where Mr. J. Ward, J.P., the chairman of Thos. W. Ward, Ltd., has presented a portrait of **Mr. G. Wood**, assistant managing director of the company, to be hung in the board room. The portrait was painted by Mr. Ernest Moore. Mr. Wood joined the company in 1897, was appointed a local director in 1919, a director in 1923 and assistant managing director in 1928. He is also on the boards of a number of other companies.

Obituary

Mr. T. H. Scott.—We regret to announce the death of Mr. Thomas Harding Scott, which occurred suddenly on August 28th at the early age of twenty-seven years, following an operation. Mr. Scott, who was the son of Mr. W. H. Scott, chairman of Laurence, Scott & Electromotors, Ltd., was educated at Oundle and Clare College, Cambridge, and was a B.Sc. He was the moving spirit of the new L.S.E. Social Club at Norwich, which in a few months had grown to a membership of over 1,000, and he was very popular with the staff and workpeople. He leaves a wife and a baby daughter.

Mr. G. Liddle.—The death is reported of Mr. George Liddle, which occurred on August 27th. Mr. Liddle had been associated with the Electrical Department of Hawkins Bros., Ltd., at Vale Road, Tottenham, for many years.

Mr. A. Newlands.—The death occurred on August 28th at the age of sixty-eight of Mr. A. Newlands, C.B.E., M.Inst.C.E., who at the time of his retirement in 1933 was chief civil engineer to the London Midland & Scottish Railway. Mr. Newlands took particular interest in the utilisation of water power, and in addition to being the author of papers and addresses on the subject, was a member of the Water Power Resources Committee appointed by the Board of Trade in 1918, and also of the Water Power Section of the Conjoint Board of Scientific Societies.

Lt.-Col. O. T. O. Webber.—The death is announced of Lt.-Col. Oswald T. O'Kelly Webber, R.E., and Royal Corps of Signals (retired), M.I.E.E., which occurred at Burstpierpoint, Sussex, on August 25th. Lt.-Col. Webber became an associate of the Institution of Electrical Engineers in 1894, an associate member in 1899, and a member in 1907.

Mr. R. Starzynsti.—The death occurred suddenly in Warsaw recently at the age of forty-eight years of Mr. Roman Starzynsti, who for the past three years had been chief of the radio broadcasting system in Poland.

Mr. W. Drake.—We regret to record the death of Mr. Whitford Drake, president of Electrical Research Products, Inc., and a director of the Western Electric Co., Ltd., which occurred at his home in Massachusetts on August 24th.

Herr W. Dommisse.—The death recently occurred at Bandoeng, Dutch East Indies, at the early age of forty-six years, of Herr W. Dommisse, the head of the telegraph division of the Posts and Telegraphs Department of the Dutch East Indies.

Will.—Lt.-Col. C. A. D. George, late director of the British, Foreign and Colonial Automatic Light Co., Ltd., left £179,374, with net personalty £109,525.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Thermatic Appliances, Ltd.—Private company. Registered August 16th. Capital, £100. Objects: To carry on business as manufacturers, importers and exporters of and dealers in surgical, medical, curative and scientific appliances, instruments, supplies and equipment, &c. The subscribers are: H. W. Bradbury, 66, Douglas Road, Handsworth, Birmingham; and G. E. Smith, 73, Redditch Road, Handsworth, Birmingham. Solicitors: Docker Hosgood and Co., 10, Newhall Street, Birmingham, 3.

Siemag, Ltd.—Private company. Registered August 20th. Capital, £100. Objects: To carry on the business of consulting, rolling mill, mechanical, electrical, hydraulic, contracting and general engineers, manufacturers of domestic and other machinery, founders, &c. The subscribers are: G. Harle and C. A. Garrett, both of 2, Bond Court, Walbrook, E.C.4. Solicitors: Linklaters and Paines, 2, Bond Court, Walbrook, E.C.4.

Teenaphot, Ltd.—Private company. Registered August 23rd. Capital, £500. Objects: To carry on the business of manufacturers of and dealers in recording instruments for light and sound, scientific instruments and any motors or parts of motors applicable thereto, electrical plant and wireless sets and components; precision, motor, mechanical and general engineers, &c. The subscribers are: E. Wallace, 51, Murdoch Road, Handsworth, Birmingham, and A. Serne, 81, Cranford Lane, Heston, Middlesex. Secretary: J. H. Foster, 6, Broad Street Place, E.C.2.

Hartley & Bramhall, Ltd.—Private company. Registered August 23rd. Capital, £1,000. Objects: To carry on the business of wireless distributors; manufacturers of and dealers in electric lamps, neon signs, electric refrigerators, electric washers and washing machines, &c. The directors are: J. Hartley, 173, Oxford Street, Barrow-in-Furness, and H. Bramhall, 32, Gateshead Street, Barrow-in-Furness. Registered office: 62, Cavendish Street, Barrow-in-Furness.

F. W. Blanshard, Ltd.—Private company. Registered August 24th. Capital, £4,000. Objects: To carry on business as electrical engineers and general electrical installation contractors, wireless engineers and service agents, motor, mechanical, power and general engineers, &c. The directors are: F. W. Blanshard, 17, Birdhurst Gardens, South Croydon, C. H. Smith, 18, Church Street, Twickenham, and J. L. Richards, 88, Bramerton Road, Beckenham, Kent.

Platalux Co., Ltd.—Private company. Registered August 22nd. Capital, £1,500. Objects: To carry on the business of designers, manufacturers, factors, fitters, repairers and merchants of and dealers in electric light and other lamps, electric fires, radiators, irons, electric and gas refrigerators, name plates and signs, wireless apparatus, &c. The subscribers are: A. Fletcher, 38, Wildwood Road, N.W.11, and I. R. Clark, 41, St. Clair Drive, Worcester Park. Registered office: Plantation House, Fenchurch Street, E.C.3.

Crucible & Electric Steels (P.H.B.), Ltd.—Private company. Registered August 26th. Capital, £500. Objects: To carry on business as manufacturers, factors and merchants of crucible, electric and steel alloys, carriers of goods, iron and steel merchants, &c. The directors are: P. H. Boyle, and Mrs. L. Boyle, both of Holmdene, 689, Manchester Road, Sandygate, Sheffield. Secretary: L. Boyle. Registered office: Surrey Works, Broadfield Road, Sheffield.

Southern Battery Co., Ltd.—Private company. Registered August 24th. Capital, £1,000. Objects: To acquire the business of an electrical and battery engineer carried on by R. H. Lawford as the Southern Battery Co., at 126, MacNaghten Road, Bitterne Park, Southampton. The first directors are: R. H. Lawford, electrical engineer (permanent), and Mrs. Lawford, both of "Ennerdale," Glenfield Avenue, Bitterne, Southampton. Registered office: 126, MacNaghten Road, Southampton.

Broadley & Roberts, Ltd.—Private company. Registered August 27th. Capital, £5,000. Objects: To acquire the business of automobile and general electrical and radio engineers now carried on by R. F. Boardley and E. J. Roberts at The Triangle, Lowestoft. The first directors are: R. F. Boardley, 7, Yeovil Road, Lowestoft, and E. J. Roberts, 86, St. Margaret's Road, Lowestoft.

B. & S. Radio (London), Ltd.—Private company. Registered August 25th. Capital, £500. Objects: To carry on the business of manufacturers of and dealers in electrical and mechanical

appliances, gramophones, wireless, &c. The first directors are L. Saunderson and F. S. Kochanski. Registered office: 76, Star Road, W.14.

Bell & Hull, Ltd.—Private company. Registered in Belfast August 22nd. Capital, £6,000. Objects: To acquire the business of electrical wholesalers and manufacturers' agents carried on as Bell & Hull. The directors are: J. P. H. Bell, 185, Sandown Road, Belfast, and N. L. Hull, Kensington Park, Belfast. Registered office: 17, College Street, Belfast.

Goodwill Contacts, Ltd.—Private company. Registered August 22nd. Capital £500. Objects: To carry on the business of manufacturers, merchants, importers, exporters, home trade and shipping merchants, wholesale and retail dealers in and distributors of vacuum cleaners, refrigerators, wireless sets, &c. The directors are: O. H. Fruh (permanent governing director), 8, Golders Close, Edgware, Middlesex, and J. B. G. Fruh, 37, St. Andrew Drive, Stanmore, Middlesex. Solicitors: G. & G. Keith, 18, Southampton Street, W.C.1.

Returns of Electrical Companies

W. T. Henley's Telegraph Works Co., Ltd.—Capital, £1,500,000 in £1,300,000 ordinary stock and £200,000 4½ per cent. cumulative preference stock. Return dated May 13th, 1938. All stock taken up. £912,480 paid on £413,080 ordinary and £199,400 preference stock. £887,520 considered as paid on £886,920 ordinary and £600 preference stock. Mortgages and charges nil.

Electro-Plant, Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1937 (filed May 14th, 1938). 700 shares taken up. £700 paid. Mortgages and charges nil.

Ringwood Electric Supply Co., Ltd.—Capital, £50,000 in £1 shares. Return dated March 16th (filed May 2nd), 1938. All shares taken up. £50,000 paid. Mortgages and charges nil.

Sunray, Ltd.—Capital, £2,000 in £1 shares. Return dated April 29th, 1938. All shares taken up. £2,000 paid. Mortgages and charges nil.

Submarine Signal Company (London), Ltd.—Capital, £1,000 in £1 shares. Return dated April 13th, 1938. All shares taken up. £1,000 paid. Mortgages and charges nil.

Park Royal Engineering Co., Ltd.—Capital, £50,000 in £1 shares. Return dated April 6th, 1938. 37,605 shares taken up. £36,605 paid, £1,000 considered as paid. Mortgages and charges nil.

Cable & Wireless, Ltd.—Capital, £30,000,000 in £1 shares. Return dated May 30th, 1938. All shares taken up. £1,266,493 paid, £28,733,507 considered as paid. Mortgages and charges nil.

Macfarlane Electrical Co., Ltd.—Capital, £3,000 in £1 shares. Return dated September 28th, 1937 (filed May 2nd, 1938). All shares taken up. £3,000 paid. Mortgages and charges, nil.

Wand & Mitchell, Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1937 (filed May 4th, 1938). 302 shares taken up. £302 paid. Mortgages and charges nil.

C. P. Ribton, Ltd.—Capital, £500 in £1 shares. Return dated August 11th, 1937 (filed May 4th, 1938). All shares taken up. £500 paid. Mortgages and charges nil.

Sheffield Electric Power Co., Ltd.—Capital, £2,000 in £1 shares. Return dated December 31st, 1937 (filed March 29th, 1938). Two shares taken up. £2 paid. Mortgages and charges nil.

Woodfyt Sales, Ltd.—Capital, £2,550 in 1,550 ordinary and 1,000 preference shares of £1. Return dated May 18th, 1937 (filed May 4th, 1938). 255 ordinary and 858 preference shares taken up. £1,113 paid. Mortgages and charges nil.

Standage Power Couplings, Ltd.—Capital, £2,000 in 1,000 preference and 1,000 ordinary shares of £1. Return dated January 15th (filed May 24th), 1938. 1,000 ordinary and 800 preference shares taken up. £2,300 paid (£1 per share, plus premiums of 11s. 1½d. on 450 ordinary and £5 on 50 ordinary shares). Mortgages and charges nil.

Gibrico Electric, Ltd.—Capital, £1,000 in £1 shares. Return dated June 18th, 1937 (filed May 20th, 1938). 800 shares taken up. £400 paid, £400 considered as paid. Mortgages and charges nil.

Robert Scaife (Colne), Ltd.—Satisfaction to the extent of £740 on June 21st, 1938, of debentures authorised May 12th, 1934, and registered September 14th, 1934.

A.E.W., Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated August 5th, 1938, to secure £300. Holder: A. E. Watkins, 244, Dollis Hill Lane, N.W.2.

Harvey (Electrical Engineers), Ltd.—Charge dated December 6th, 1934, on 22, Fitzroy Square, and 4 and 5, Fitzroy Mews, W. (being property acquired by the company on July 23rd, 1938). Amount owing: £3,000. Registered pursuant to Section 81 of the Companies Act, 1929. Mortgagees: Pearl Assurance Co., Ltd.

Reliance Manufacturing Co. (Southwark), Ltd.—Deposit on July 29th, 1938, of deeds of land in Sutherland Road, Walthamstow, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Yorkshire Electric Transformer Co., Ltd.—The nominal capital has been increased by the addition of £5,000 in £1 ordinary shares beyond the registered capital of £10,000.

Harland Engineering Co., Ltd.—The nominal capital has been increased by the addition of £180,000 beyond the registered capital of £120,000. The additional capital is divided into 240,000 6 per cent. cumulative preference shares of 10s. each and 240,000 ordinary shares of 5s. each. The 30,000 preference shares of £1 in the registered capital have been sub-divided into 10s. preference and the 90,000 ordinary of £1 into 5s. ordinary shares.

Strand Electric Holdings, Ltd., held its annual meeting on August 30th, when Mr. F. L. Blow (chairman), who presided, said that during the year under review the work of the company had been dislocated for some months owing to the removal to the new factory, but the better conditions now existing would assist the output very materially. Notwithstanding the interruption and the additional overhead expenses, there was an increase of over 11 per cent. in the trading profit on a larger turnover. They would be in full occupation of their new West End premises within a few weeks. The first returns of the new branch at Manchester showed that a profitable start had been made. They had associated themselves with Beck & Pollitzer Contracts, Ltd., one of the leading concerns engaged in exhibition stand fittings and a small company had been registered Beck & Pollitzer-Strand Electric, Ltd. The results so far had been entirely satisfactory. Their position in the theatre lighting world continued to improve. At the present time they were busy in all departments and a considerable amount of their equipment was in use at the Glasgow Exhibition, "Radiolympia" and most of the principal theatres, leading music halls and cinemas.

City Notes

The Paterson Engineering Co., Ltd.—Presiding at the annual meeting held on August 25th, Mr. W. Paterson (chairman), in the course of his speech, said that recently he expressed the hope that the greater availability and reduced cost of electricity might lead to the wider application of their ozone water steriliser. They had spent a considerable amount of money in this development and there were a number of installations in continuous use for drinking water supplies and swimming pools. They had completed a water purification installation for the St. Anne's Board Mills, Bristol, having a capacity of 16,000,000 gallons daily, possibly the largest existing for industrial requirements.

Companies Struck off the Register.—The names of the following companies will be struck off the register at the expiration of three months unless cause is shown to the contrary:—British Electrotechnical Specialist Manufacturers' Association, Ltd.; Colton Electrical Appliances, Ltd.; Direct Radio, Ltd.; Kershaws (Electrical Engineers), Ltd.; Radio Disposals, Ltd.; Radio-Technique, Ltd.; Tyrela Radio, Ltd.; Yeldon (Radio), Ltd.

Sun Electrical Co., Ltd., has announced a first and final dividend of 5 per cent. (unchanged).

Brown Brothers, Ltd., have declared an interim dividend of 2½ per cent., less tax (same).

Walsall Conduits, Ltd., has declared an interim dividend of 20 per cent. on the ordinary shares (same).

Pinchin, Johnson & Co., Ltd., are maintaining the interim ordinary dividend at 7½ per cent., less tax.

The British Columbia Power Corporation is paying a quarterly dividend of 50 cents on class "A" shares (unchanged).

Stocks and Shares

TUESDAY EVENING.

THE gravity of the political crisis which developed in connection with Continental politics had a depressing effect upon stocks and shares in practically every market. At the beginning of the week, selling orders arrived in considerable volume. Few buyers came forward to take the stock offered by nervous holders, the inevitable consequence being that quotations had to give way. The fall extended to prices of stocks and shares that might be assumed to stand outside the pale of any possible influences from European disturbances.

With the fear of war sitting like a black dog upon the shoulders of every market—security and commodity alike—only the hardy buyer had sufficient courage to venture capital into markets severely shaken by the possibility of a clash of arms. That war would, or could, break out was an idea scouted by everybody. At the same time, the apprehension of such a thing led to selling from Paris, New York, and other centres besides those in this country.

The markets with which these notes particularly deal, succeeded in standing up to the depression in a steadier manner than was displayed by the majority of other markets. There are 17 falls in prices—none of them of any real consequence—and, somewhat surprisingly, there are 5 rises.

Home Rails

Last week's railway traffic figures showed, at least, no further deterioration in the trend of the companies' receipts. With this somewhat negative comfort, aided by buying on the part of bargain hunters and covering on the part of the bears, prices picked up a small part of the past month's headlong decline. Many quotations are, nevertheless, near where they languished in the dark days of the 1930-1932 depression. Chief sufferers are, of course, the so-called marginal stocks: that is to say, the issues on which the interest was barely or insufficiently covered by last year's earnings. After the recent revelations shown by the companies' half-yearly profit statements, it is regarded as assured that some of the prior-charges, which received last year either full or partial payment of interest, will be left uncovered this year by the dwindling of revenues. Even the first debentures and guaranteed stocks which appear to enjoy an ample margin of safety against any likely contingency, have not escaped depreciation. But London Passenger Transport "C" stock has moved up 10s., to 74.

London Transport "C" Stock

According to the Act under which it was formed, the London Passenger Transport Board must this year pay the full standard dividend of 5½ per cent. on the "C" stock, or give stockholders the opportunity of applying for the appointment of a receiver. Few people entertain the idea of this opportunity being grasped; much less of such an application being successful. But the coming dividend decision loses, thereby,

nothing of its interest to the stockholders. In order to meet a 5½ per cent. dividend on the "C" stock, the Board would have to distribute £320,000 more than it did in paying last year's dividends totalling 4¼ per cent. According to the weekly traffic figures, gross receipts, during the year ended last June, were £667,000 up on the previous year's. The other railway companies have already shown in their half-yearly statements to what extent rising costs are able to ruin the picture. It would be rash, therefore, to expect that the higher receipts will count for a great deal when translated into net profits. All things considered, the general expectation is that the latter will not cover the standard dividend, and that payment of 5½ per cent. will not be made unless regarded by the Board as a matter of life or death. In this most improbable event, a raid might be expected on the eight million pounds renewals fund. Last year's dividend was declared early in October.

No Response

Observation expresses frequent surprise at the manner in which the share-prices of various electrical and engineering companies decline to respond to good reports and dividends from those undertakings. Yields ranging from 7½ per cent. to 10 per cent. on the money are not uncommon. Yet there is no particular demand for the shares. If anything, prices show a dull disposition, for which the reason, shortly stated, is the public's apprehension of decline in trade. Can profits continue on their last year's scale? Will not dividends have to come down? Is the capitalisation warranted under a state of general industrial recession such as Board of Trade and home railway returns now indicate? These are a few of the questions negatively answered by the heaviness of prices and the reluctance of money to accept even high returns from ordinary shares in good companies. The explanation may sound humdrum and prosaic: it is none the less an accurate presentation of the reasons for market movements puzzling to a good many people just now.

Radio Shares

Radiolympia has not done a great deal as yet to alleviate the friendless state of wireless and television shares. Interest in the market has gone to the inquiry stage, but has not developed sufficient activity to help prices by more than a few pence here and there. Results published of late by the various companies have been generally discouraging. Philco, for instance, this year passed the ordinary and preference dividends, although 25 per cent. was paid last year on the ordinary capital. E. K. Cole have distributed an unearned 10 per cent., against 30 per cent. previously, on the ordinary shares. Pye has done well to maintain the 25 per cent. on the deferred capital, although profits were well down. Hopefulness with regard to early improvement is restrained by the evidence of a general slowing down in trade, and the idea that under these conditions the semi-luxury businesses are badly exposed to the draught.

Prices and Yields

A yield of close on 14 per cent. on Pye 5s. deferred, at 9s., suggests that the current year may disturb an excellent dividend record. E. K. Cole 5s. shares, which have moved up a little to 8s., give a return of about 6½ per cent. on the 10 per cent. dividend. Philco 2s. shares stand at their par price, and Ultra 5s. shares at 1s. 3d. A. C. Cossor 5s. shares have strengthened lately to 4s. The company co-operates with Ismay Industries, and has yet to issue its first report. In television issues, there is not yet any noticeable anxiety to discount the future. Scophony 5s. shares are 4s. Baird Television 20 per cent. preferred are under 1s., but the deferred—oddly enough—are nearer 2s. Both have a denomination of 2s. 6d. Electric and Musical Industries' interests spread, of course, well beyond the radio and television field. If the dividend, which is due in a few weeks' time, is maintained at 10 per cent., the yield will be a round 8 per cent. at the present price of 12s. 6d. A modest reduction in the dividend will arouse no great surprise.

Miscellaneous Matters

America is taking, for the time being, second place to Europe so far as the news from these two quarters concerns London stock markets. This is not to say, however, that Wall Street has ceased to exercise a strong pull on prices over here. In the past week, the pull has been jerky, although with a generally upward direction. Utilities have been in better favour, American "Tel. and Tel." stock, for instance, being up 2 points to 146½. Railroad issues also have a brighter appearance. Few price movements worthy of note have occurred in the idle Home industrial markets. There is no change to report in the recently lively electrical equipment trio of Callenders, Cromptons and Enfields. British Insulated shed ⅛ to 4½. Lancashire Dynamos are lower, at 58s. 9d., and Ismay Industries have been depressed to 2s. 6d. since news of the changes in the management. Electricity supply shares have hardened in one or two instances, possibly in reflection of the gilt-edged market's comparative firmness. Cable and Wireless stocks gave way further, and the ordinary at 45½ is 2 down, but the two other stocks show no change on balance. Anglo-American Telegraphs are weak. Marconi Marines went back to 26s. 3d. A fall of 25, to 925, indicates a sympathetic reflection of the general market tone in British Electric Traction deferred stock.

Share List of Electrical Companies

	Dividend. Nom.	Previous.	Last.	Price Aug. 30.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	66/3	—	4 10 7
City of London	1	7½	7½	33/6	—	4 9 7
Clyde Valley	1	7	8	38/–	—	4 4 3
County of London	1	10½	10½	49/6	—	4 4 7
Edmundson's 7% Pref.	1	7	7	32/6	—	4 7 6
Do. Ord.	1	8	9	26/6	–6d.	—
Elec. Dis. Yorkshire	1	9	9	42/9	—	4 2 2
Elec. Fin. and Securities	1	12½	12½	50/–	—	5 0 0
Elec. Supply Corporation	1	11	12	55/–	+⅛	4 7 5
Lancs Light and Power	1	7½	7½	32/–	—	4 13 9
Lond. Assoc. Electric	1	—	7	30/–	—	4 13 4
London Electric	1	8	7	35/6	—	3 19 0
London Power Deb. Red.	Stock	5	5	105	—	4 15 3
Metropolitan	1	10	12	49/6	–6d.	4 17 0
Midland Counties	1	7½	8	38/6	+6d.	4 3 3
Mid. Elec. Power	1	8	9	40/9	—	4 8 3
North Eastern Electric Ordinary	1	7	7	33/–	—	4 4 10
Do. 7% Pref.	1	7	7	33/–	—	4 4 10
Northampton	1	10	10	46/3	—	4 6 7
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	10	48/9	—	4 2 0
Do. do. 6% Pref.	1	6	6	29/6	—	4 1 4
Scottish Power	1	8	8	38/–	—	4 4 3
South London	1	7	7	32/–	—	4 7 6
Victoria Falls Ord.	1	12	13½	73/9	—	3 13 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	18/9	—	8 0 0
Yorkshire Elec.	1	8	8	41/–	—	3 18 1
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	113	—	4 8 6
Do. 1955–75	,,	5	5	117	+½	4 5 6
Do. 1951–73	,,	4½	4½	109	—	4 2 7
Do. 1963–93	,,	3½	3½	101	—	3 9 4
London Elec. Trans. Gtd.	,,	2½	2½	92	—	2 14 4
London & Home Counties, 1955–75	,,	4½	4½	112½	—	4 0 0
London Passenger Transport, A	,,	4½	4½	118½	—	3 16 9
Do. do. B	,,	5	5	119½	—	4 3 8
Do. do. C	,,	4	4½	74	+½	5 14 8
West Midlands Joint Elec. 1948–68	,,	5	5	113	—	4 8 6
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$160	9	9	146½	+2	6 2 10
Anglo-Am. Tel. Pref.	Stock	6	6	108	–1½	5 11 1
Do. Def.	,,	1½	1½	25	–1	6 0 0
Cable & Wireless 5½% Pref.	,,	4½	5½	94½	—	5 16 5
Do. Ord.	,,	—	4	45½	–2	8 15 10
Do. Income	,,	—	—	102	—	3 18 2
Globe Tel. & Tel. Ord.	1	5½*	7½*	31/3	—	4 16 2
Do. do. Pref. Ord.	1	6	6	27/6	—	4 7 3
Great Northern Tel.	10	20	20	40	—	5 0 0
Marconi-Marine	1	10	7½	26/3	–⅛	5 14 4
Oriental Telephone Ord.	1	12*	12*	57/6	—	4 3 8
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	5/–	—	—
Do. do. 2nd Pref.	5	Nil	Nil	5/–	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	10	–1	—
British Electric Traction Def. Ord.	,,	5	5	925	–25	—
Do. do. Pref. Ord.	,,	8	8	170	—	4 14 2
Brazil Traction	$100	70 cts.	$1	11¼	–¼	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	100	—	5 0 0
Mexican Light Common	$100	Nil	Nil	1	—	—
Do. do. 1st Bonds	$500	5	5	25½	—	—
West Riding	1	6½	10	35/–	—	—
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	15	15	1⅝	—	9 4 8
Assoc. Elec. Ord.	1	10	10	37/–	–1/–	5 8 3
Do. Pref.	1	8	8	37/–	—	4 6 6
Babcock & Wilcox	1	10	10	37/–	—	5 8 1
British Aluminium Ord.	1	10	12½	48/9	—	5 2 6
British Insulated Ord.	1	20	20	4½	–⅛	4 9 0
Brush Ord.	5/–	Nil	Nil	5/3	—	—
Callenders'	1	20	20	4½	—	4 2 0
Do. 6½% Pref.	1	6½	6½	31/3	—	4 2 4
Crompton Parkinson Ord.	5/–	12½	12½	26/3	—	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	10	12½	33/9	—	7 8 0
Enfield Cable Ord.	1	25	25	2½	—	—
English Electric	1	Nil	10	30/6	—	6 11 0
Do. do. Pref.	1	6½	6½	26/–	—	5 0 0
Ericsson Tel.	5/–	25	25	37/6	–⅛	3 6 8
Ever Ready	5/–	45	35	18/–	–6d.	9 14 6
Ferranti Pref.	1	7	7	27/6	—	5 2 0
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	17½	20	76/6	–6d.	5 4 7
Henley's	5/–	15	20	20/9	–6d.	4 18 1
Do. 4½% Pref.	1	4½	4½	21/3	—	4 4 8
India-Rubber Pref.	1	5½	5½	21/3	—	5 3 6
Johnson & Phillips	1	10	12½	38/3	–6d.	6 11 0
Lancashire Dynamo	1	20	25	58/9	–⅛	8 10 0
Siemens Ord.	1	7½	7½	23/9	—	6 6 4
Telegraph Construction	£1	7½	10	2½	—	4 14 0

* Dividends are paid free of Income Tax.

New Patents

Electrical specifications recently published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 23, Southampton Buildings, London, W.C.2.

1936

10460. "Switching system for electric consuming devices." R. M. Erricker. August 28th, 1936. (489644.)

29785. "Remote-control systems on three-phase electric networks." G. Santucci. October 31st, 1935. (489694.)

29890. "Electrical musical instruments." A. H. Midgley, and A. M. Midgley. November 3rd, 1936. (Addition to 454720.) (489695.)

30181. "Manufacture of improved electrical insulating material from cellulose." L. S. E. Ellis. (Chemical Works, formerly Sandoz.) November 5th, 1936. (489928.)

32798. "Electron-optical systems." Marconi's Wireless Telegraph Co., Ltd. November 30th, 1935. (Cognate applications 32799/36 and 32800/36.) (489846.)

35779. "Electro-mechanical device for controlling knitting-frames, weaving looms, and cord-cutting machines." Y. Huinnet. December 31st, 1935. (489699.)

1937

72. "Electric translating circuits." British Thomson-Houston Co., Ltd. January 2nd, 1936. (489702.)

172. "Thermionic valve oscillators and amplifiers." N. L. Yates-Fish, P. W. Willans, and Muirhead & Co., Ltd. January 4th, 1937. (489849.)

254. "Electric fires and like heating appliances." G. H. Collins, and H. F. Collins. January 4th, 1937. (489850.)

2760. "High-frequency transmission lines." E. C. Cork, and J. L. Pawsey. January 30th, 1937. (489704.)

2765. "Electric current-transformers of the core-balance type." A. Reyrolle & Co., Ltd., H. Leyburn, and W. Gray. January 30th, 1937. (489650.)

2782. "Light-reflectors and lanterns." British Thomson-Houston Co., Ltd., F. W. Thorpe, and R. Maxted. January 30th, 1937. (489652.)

2933. "Telephone systems and automatic switches suitable for use therein." Automatic Telephone & Electric Co., Ltd., and J. St. C. W. Graham. February 1st, 1937. (489665.)

2951. "Electrical wave generators suitable for use in television and like apparatus." Marconi's Wireless Telegraph Co., Ltd. January 31st, 1936. (489666.)

2982. "Coil-mounting systems for high-frequency circuits." Marconi's Wireless Telegraph Co., Ltd. January 31st, 1936. (489669.)

2994. "Electrically heated irons." Co-operative Wholesale Society, Ltd., and R. H. Line. February 2nd, 1937. (489708.)

3046. "Electromagnetic cut-in switches for electrical supply installations on vehicles." N. H. Morris. February 2nd, 1937. (489712.)

3061. "Television and like systems." Baird Television, Ltd., and A. J. Brown. February 2nd, 1937. (489715.)

3062. "Methods of modulating television and like signals upon carrier-waves." Baird Television, Ltd., and A. J. Brown. February 2nd, 1937. (489716.)

3063. "Television and like systems." Baird Television, Ltd., V. A. Jones, and T. C. Nuttall. February 2nd, 1937. (489717.)

3070. "Electric arc-welding machines." British Thomson-Houston Co., Ltd. February 3rd, 1936. (489718.)

3128. "Apparatus for receiving sounds and for determining the direction of origin." W. Kunze, H. Kietz, and Atlas-Werke Akt. Ges. February 3rd, 1937. (489671.)

3196. "Cases and the like for the transport and/or storage of wireless valves, electric lamps, and other frangible articles." M-O Valve Co., Ltd., H. G. Coker, and J. F. Turner. February 3rd, 1937. (489945.)

3197. "Cases and the like for the transport and/or storage of wireless valves, electric lamps, and other frangible articles." M-O Valve Co., Ltd., and J. F. Turner. February 3rd, 1937. (489946.)

3234. "Electrical signalling systems." Automatic Telephone & Electric Co., Ltd., and P. N. Roseby. February 3rd, 1937. (489772.)

3238. "Radio antennae." Marconi's Wireless Telegraph Co., Ltd. February 3rd, 1936. (489774.)

3239. "Antenna systems." Marconi's Wireless Telegraph Co., Ltd. February 3rd, 1936. (489775.)

3258. "Apparatus for the reception of sound-vibrations." Metallwerk A. Schwarz Ges. February 3rd, 1936. (489777.)

3283. "Striking and chiming gears for synchronous motor electric clocks and the like." T. A. Brown, and Perivale Clock Manufacturing Co., Ltd. February 4th, 1937. (489855.)

3291. "Permanent magnet assemblies for sound-transforming apparatus." E. Hausdorf. February 4th, 1936. (490010.)

3323. "Automatic overload switches." E. Zahradnik, and H. Hitschmann. February 4th, 1937. (Convention date not granted.) (490011.)

3333. "Projection of cathode-ray tube images." British Thomson-Houston Co., Ltd., and W. J. Scott. February 4th, 1937. (490029.)

3349. "Light signals for railways and the like." R. M. MacGregor, and Westinghouse Brake & Signal Co., Ltd. February 4th, 1937. (489861.)

3412. "Thermionic valve and other electric circuits." A. D. Blumlein. February 5th, 1937. (489950.)

3423. "Electric couplings." Hermetic Rubber Co., Ltd., and G. F. Colledge. February 5th, 1937. (490013.)

3482. "Alarm signalling arrangements in connection with telephone and like exchange systems." Standard Telephones & Cables, Ltd. May 27, 1936. (490015.)

3494. "Lamps for floodlighting and like purposes." C. H. A. Kempton, and J. P. C. O. St. Clair. February 5th, 1937. (490016.)

3534. "Control of electric-discharge tubes." Franco-British Electrical Co., Ltd., and A. H. Brackensey. February 5th, 1937. (490019.)

3619. "Rotary electric switches." Diamond H Switches, and C. A. Turner. February 6th, 1937. (489962.)

3685. "Electro-optical cells." Baird Television, Ltd., and J. L. Baird. February 8th, 1937. (489964.)

3686. "Inertia-less switching devices." Fernseh Akt.-Ges. February 7th, 1936. (489965.)

3773. "Electric protective devices." Ferranti, Ltd., J. L. Miller, and M. Whitehead. February 9th, 1937. (489737.)

4656. "Convector electrical heating unit." Bratt Colbran, Ltd., and R. H. Masterman. February 16th, 1937. (489782.)

4697. "Electric trolley vehicles." S. S. Guy, R. Dean-Averns, and J. E. Reece. February 17th, 1937. (489868.)

10617.—"Carrier-wave signalling apparatus." Standard Telephones and Cables, Ltd. April 18th, 1936. (489743.)

11329. "Electric cables." Allgemeine Elektricitäts Ges. April 21st, 1936. (489798.)

14548. "Etching electrode metal for electrolytic condensers and the like." Mallory Patents Holdings Co., Ltd. August 6th, 1936. (489884.)

20374. "Negative glow electric-discharge lamps." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen.) July 22nd, 1937. (489893.)

20548. "Reversing control apparatus for a plurality of electric motors." Igranic Electrical Co., Ltd. July 24th, 1936. (489810.)

27493. "Manufacture of wire netting by means of electric resistance welding." W. Kramer. October 16th, 1936. (489820.)

28729. "Lighting devices." J. Oftedahl. October 21st, 1937. (489909.)

33508. "Metal-vapour electric convertors." Siemens-Schuckertwerke Akt.-Ges. December 7th, 1936. (489831.)

33990. "Retractive electric switches." R. J. Tugwood. (R. Hetherington.) December 8th, 1937. (489832.)

34012. "Wireless receiving sets." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 11th, 1936. (489914.)

1938

224. "High-frequency current transformers." C. Lorenz Akt.-Ges. February 18th, 1936. (Divided out of 488120.) (489917.)

8323. "Electric kettles." W. T. French and Son, Ltd., and A. W. French. March 18th, 1938. (489921.)

10047. "Methods of manufacturing dynamo-electric machines." British Thomson-Houston Co., Ltd. April 1st, 1937. (489999.)

10820. "Electric discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 22nd, 1936. (Divided out of 17151/37.) (489923.)

14986. "Electric-discharge lamps." British Thomson-Houston Co., Ltd. May 21st, 1937. (489925.)

18804. "Electric signalling systems." Standard Telephones and Cables, Ltd., E. P. G. Wright, and C. B. V. Neilson. January 25th, 1937. (Divided out of 489545.) (489755.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from August 24th:—

Telescophon. No. 586774. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Scophony, Ltd., Thornwood Lodge, Campden Hill, W.8.

Sunostat. No. 586302. Class 11. Instruments, apparatus and contrivances (not medicated) for surgical or curative purposes or in relation to the health of man or animals.—Watson & Sons (Electro-Medical), Ltd., Sunic House, 43-47, Parker Street, Kingsway, W.C.2.

Sheltlite. No. 585530. Class 13. Electric lamps (ordinary) and electric lighting, heating and power fittngs, all made of ordinary metal.—The Chloride Electrical Storage Co., Ltd., Exide Works, Clifton Junction, near Manchester.

Sotobed. No. 587010. Class 13. Electrical heating, lighting and power fittings of ordinary metal.—Edwin H. Cooper and Egerton Warren, trading as Cooper and Warren, 94, Charlotte Street, W.1.

Dubrosco. No. 586595. Class 50. Insulation and impregnation compositions composed of resin, oil and bitumen for electrical purposes, &c.—J. C. Dussek Bros. & Co., Ltd., Jolly Farmers' Wharf, Thames Road, Crayford, Kent.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

THERMOLIER heating system.
MERCER micrometer.
BEXHALL & HEATH oil break switch.
LIGHTNING toaster.
RUSTOL fluid.
SIRIUS fittings.
C. J. SIMMONS resistance bridges.
Push-button fire switch for neon signs.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Grammar school extensions (£100,000); governors.
Abingdon.—Houses (90), Drayton estate; borough engineer.
Alloa.—Extensions at County Accidents Hospital (new steriliser, &c.) to cost £3,000; medical superintendent.
Arnold.—Shops, corner of Breck Hill Road and The Crescent, for Nottingham Co-operative Society, Ltd., Upper Parliament Street.
Belford.—Houses, Ellingham, for the R.D.C.; Hetherington and Wilson, County Chambers, 52, Westgate Road, Newcastle-on-Tyne.
Berwick-on-Tweed.—Baths, &c. (£47,850); borough engineer.
Bilston.—Houses (344), St. Chad's estate; borough engineer.
Blackwell (DERBYSHIRE).—Houses (104), Tibshelf & Clapwell; R.D.C. surveyor.
Blundeston (SUFFOLK).—Church school (£16,000); Lothingland Church School Committee.
Blyth (NORTHUMBERLAND).—Houses (58); T. Wilson, borough engineer, Blyth.
Bramford (SUFFOLK).—Development, Riverhill estate; T. Parkinson & Son.
Branston (LINCS).—Social centre; Parish Council.
Brownhills.—Baths; U.D.C. surveyor.
Corby.—Cinema, High Street, for Mr. B. J. Wilson; Gotch. Saunders and Surridge, architects, Bank Chambers, Kettering.
Cumberland.—Gymnasium at the Whitehaven secondary school; county architect, 4, Alfred Street North, Carlisle.
Dartford.—Explosives factory, Green Lane; Joseph Wells & Sons, Ltd., Honor Oak Park, S.E. Workshops, Spital Street; J. C. Beadle, Ltd.
Debenham.—School (£11,000); Voluntary School Committee.
Dewsbury.—Reconstruction of the Albert Hall, Bradford Road; K. W. Binks & Sons, builders, Ackroyd Street, Morley.
Doune.—Factory for the Rapid Floor Co., 59, New Oxford Street, London, W.C.1.
Dudley.—Church and church hall; Webb and Gray, architects, 200 High Street, Dudley.
Durham.—Social club building; R. Burke, architect, Singleton House, Newcastle-on-Tyne.
Earl Soham.—Houses (12); Blyth R.D.C. surveyor.
East Suffolk.—Extensions to County Hall, and erection of schools, Lowestoft and Stowmarket; county surveyor, Ipswich.
East Sussex.—Schools, Rye, Portslade and Burgess Hill, and police headquarters, Lewes; county surveyor, Lewes.
Eye.—Houses (10), E. L. Hunt. Cinema, Lambeth Street; A. M. Sanders.
Ferryhill (Co. DURHAM).—Sports stadium; Parish Council.
Formby.—Senior school; A. Gilbertson, architect, 15, Tithebarn Street, Liverpool.
Friston (SUFFOLK).—Estate development; A. E. Cracknell.
Girvan.—Lido, Carleton estate; G. J. A. Cathcart-Walker-Heneage.
Gisleham (SUFFOLK).—Estate development; T. Tovell.
Great Broughton (CUMBERLAND).—Houses (20); T. Nicholson, 37, Washington Street, Workington.
Hampshire.—Junior school, Basingstoke; county surveyor, Winchester.
Haslemere.—Swimming pool; U.D.C. surveyor.
Hornage (BUCKS).—Senior school; Bernewode Church Council.
Jarrow-on-Tyne.—Five years' educational programme, including four new schools; borough engineer. Extensions, Jarrow Tube Works, Northbourne Road; works architect.
Keighley.—Houses (100), Exley Head; A. Sharp, Ltd., builders, Oakworth.
Kidderminster.—Erection of gymnasium block at King Charles the First school; A. H. Guest, Ltd., contractors, Coalbourne Brook, Stourbridge.
Lancashire.—Grammar school, Chorley, and hospital, Ulverston; county surveyor, Lancaster.
Leek (STAFFS).—Baths; U.D.C. surveyor.
Lincolnshire.—Extensions to Hill Avenue and Hunting Tower Road schools, Grantham; county architect, Sleaford.
Liverpool.—Flats, Mason Street and Highfield Street; L. H. Keay, housing director. Houses (25), Glengariff Street; Tyson's Contractors, Ltd., Dryden Street. Houses (20) Oldfield Road; Irving & Mosscrop, architects, 6, Stanley Street, Liverpool. Office, workroom and shops, Tarleton Street, for Lewis's, Ltd., Ranelagh Street, Liverpool, 1; Tysons (Contractors), Ltd., Dryden Street, Liverpool, 5. Warehouses, Great Howard Street, for Mersey Tobacco Bonds, Ltd.; G. Platt & Sons, Ltd., contractors, Oakes Street. Buildings, Parkside Hospital, for the Board of Management; Quiggin & Gee, architects, North House, 17, North John Street. Cinema, Waterloo, for Plaza Cinema, Ltd.; W. Spencer, contractor, 63, Caldy Road, Bull Bridge, Aintree.
Llangefni.—Isolation hospital; Anglesey C.C.
Loughborough.—Aerodrome; borough engineer.
Mablethorpe.—Catholic church; Ingram Bros., contractors, 49, James Street, Louth.
Manchester.—Houses (600), Heaton Park Road, Victoria Avenue, Blackley; Lanes Construction Co. (Manchester), Ltd., 1, Dickinson Street, Manchester.
Newcastle-on-Tyne.—Children's home at the City General Hospital; R. G. Roberts, 18, Cloth Market, Newcastle. Houses (28), in flats; R. A. Gofton & Sons, builders, Pykerley Road, Monkseaton. Public house, Westgate Road, for Newcastle Breweries, Ltd.; Mauchlen and Weightman, architects, 12, Saville Row, Newcastle. Houses (16), Longridge Avenue, &c.; F. E. Maughan, builder, Turbinia Gardens, Benton, Newcastle. Houses (22), Wharnlands Road; G. Bainbridge, builder, East Denton, Newcastle. Offices, warehouse and garage, Corporation Street, for United Yeast Co.; Mauchlen & Weightman, architects, 12, Saville Row, Newcastle. Garage, Gallowgate, for Pilgrim Investment Co., Ltd.; A. Q. Muras, architect, 21, Ridley Place, Newcastle. Garage, New Bridge Street; Haddon & Hillman, contractors, Huddlestone Street, Newcastle. Houses (32), in Copperas Lane; Oliver & Leeson, architects, Ellison Place, Newcastle. Houses (26), in flats, Dumborough Street; G. R. Holmes, architect, 1, Priors Terrace, Tynemouth. Garage, in Shields Road; C. Soloman, architect, 148, Osborne Road, Newcastle. Extensions to the Throat, Nose and Ear Hospital; Marshall, Tweedy & Bourn, architects, Grainger House, Blackett Street, Newcastle.
Northumberland.—Agricultural institute, Cockle Park (£24.000); county surveyor, Newcastle-upon-Tyne.
Nottinghamshire.—Schools, Sutton-in-Ashfield, Arnold, and West Bridgford; county surveyor, Shire Hall, Nottingham.
Oswestry.—Premises, Church Street; Westminster Bank, Ltd.
Oxford.—Branch library; city engineer.
Ruddington.—Senior school; Southwell Diocesan Board of Education.
Sale Moor.—Cinema, shops and flats, Northenden Road, for Warwick Cinemas Co.; Drury & Gomersall, architects, Imperial Buildings, Oxford Road, Manchester.
Samford.—Houses (12), Stratford St. Mary; R.D.C. surveyor.
Seaham.—Institute for Miners' Welfare Committee; Gradon and Sons, builders, North Road Sawmills, Durham.
Sheffield.—Shops (26), Herries Road; C. S. Sandford.
South Shields.—Hotel, Simonside, for Vaux and Son, Sunderland; Page, Son & Bradbury, architects, 75, King Street, South Shields.
Stockport.—School for the Chester Diocesan Church Schools Association; F. C. Saxon, architect (Lockwood, Abercrombie & Saxon), 2, Stanley Street, Chester.
Stocksbridge.—Houses (180), near Spink Hall, for U.D.C.; Walters & Westley, Ltd., contractors, 117, Springfield Road, Sheffield, 7.
Stockton-on-Tees.—Maternity home (£30,000); P. F. Burridge, architect, Council Offices.
Stoke-on-Trent.—Cinema, High Street, for Danilo Cinema, Ltd., 3, New Street, Birmingham.
Stone (STAFFS).—Electrically operated pottery works, Barlaston, for Josiah Wedgwood & Sons, Ltd., Etruria, Stoke-on-Trent; Wilson Lovatt & Sons, Ltd., contractors, Clarence Street, Wolverhampton.
Stowmarket.—Shops, Ipswich Street; E. A. L. Awkett.
Sunderland.—Eye infirmary (£90,000), all heating by electricity; D. & J. Ranken, contractors, Stockton Road, Sunderland.
Surrey.—Schools, Camberley and Malden; County surveyor, Kingston-upon-Thames.
Swinton (LANCS).—Houses (80), Campbell Road, Woodgarth, Wyville and Marlow Drives, Swinton; A. Bennett, architect. Houses (20), Cemetery Road, Brookfield Drive and Cromwell Road, Swinton; P. Nicholas, builder, 108, Monton Road, Eccles.
Tottenham.—Extensions, Downhills and Calvert schools (£48.000); Education Committee.
Tynemouth.—Gymnasium, Linskill senior school; borough engineer.
Washington (Co. DURHAM).—Houses (19); U.D.C. surveyor.
Waterloo (LANCS).—Cinema, Crosby Road North; Plaza (Crosby), Ltd.
West Hartlepool.—Houses (360), West View; C. S. Errington, architect, 46, Grainger Street, Newcastle-on-Tyne.
Wetherby.—Houses (48); R.D.C. surveyor.
Whitley Bay.—Extensions to stores; F. W. Woolworth & Co., Ltd., 1, New Bond Street, London, S.W.1.
Wickham Market.—Extensions to school (£19,325); Wm. C. Reade.
Winslow (BUCKS).—Senior school; church authorities.
Woodbridge.—Estate development; St. Peter's College trustees, Cambridge. Council offices; U.D.C. surveyor.

Television in the United States

IT now seems fairly certain, states *Reuter's Trade Service*, that a 441-line image will be adopted as the United States standard. Engineers are not yet completely satisfied with the results of certain basic operations in transmission and set manufacturers are generally holding up production until better results are obtained. Experimental television is being conducted by the National Broadcasting Co., which has a transmitter in the Empire States building at New York. With improvements recently made it is expected to give clear signals within a 40- to 60-mile radius. The Columbia system is planning to install a transmitter in the tower of the Chrysler building, New York, with studios in the Grand Central Terminal buildings. The General Electric Co. has been preparing test models of a home receiver in recent months; British television receivers are also reported to have entered the American market in small numbers, the sets coming from London. They are being adapted to the 441-line scanned image standard. Prices for television receiving sets at present range from £25 to £80.

The Institute of Vitreous Enamellers

The Institute of Vitreous Enamellers is paying an official visit to various enamelling plants, &c., in the U.S.A. from October 1st to 26th. Full particulars can be obtained from the hon. general secretary at 42, Napier Court, Hurlingham, S.W.6.